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The Copper Statistics

In going to press on Wednesday, as usual, we are unable this week to report the American copper statistics for February, which are not published until the 10th. Inasmuch as the figures will be known to our readers before this issue is in their hands, it is not worth while to forecast the February figures. It is, however, useful to correct some misunderstanding that exists respecting these statistics.

Some suspicion has been expressed as to the accuracy of the figures reported by the Copper Producers' Association. We state in the most unqualified way that in our opinion the statistics are complete and correct. If at some times they show totals that look peculiar, as for January last, the explanation is usually quite simple. Deliveries do not mean consumption. The amount of actual consumption is impossible for any of us to know, month by month, because such statistics are not collected. In any single month deliveries and consumption may be widely different, but over a long period, say a year, the totals are likely to be substantially the same.

The American statistics, taken alone, are not a good criterion of the situation in the copper market, but taken in conjunction with the European statistics, they are a good guide. Insofar as the accumulation is concerned, it is the grand total upon which attention should be fixed. That total may not comprise everything, because stocks existing at some of the Continental ports are not included, but this figure is the best available and the industry ought to be thankful for having it.

Regrinding Machines

What promised to be a valuable comparison of the relative merits of two radically different methods for the crushing of the Bingham porphyry ore has thus far failed to materialize, at least in any conclusive way. For the liberation of the mineral of this ore a decidedly fine grinding—from the standpoint of the ore-dresser—is necessary. The Utah company, conforming to the accepted tenets of good practice, adopted the principle of stage-crushing by rolls, with intermediate screening and the treatment of comparatively coarse products to extract mineral already liberated. So far so good, but then came the problem of regrinding the tailings from the preliminary separators, which constituted the real work of the mill, and for this chile mills were installed.

The Boston company came to the conclusion that inasmuch as the ore required fine grinding it might as well be effected in one operation and be done with it. Consequently, it boldly adopted the Nissen stamp, basing its conclusions upon experimental work conducted upon a comparatively small scale. This work was evidently well done, however, and in fact all of Mr. Bettles' plans were carefully considered and reflect great credit upon him, although when it was announced that the Boston company was going to adopt stamps we expressed the opinion that the choice was not the wisest and still hold that opinion.

Now, as to the results up to date there is no question about those of the Boston company having been superior in the matter of mineral extraction, the difference between the two mills being

large. The Boston mill has given all that was expected, or more, while the Utah mill has fallen short. Unfortunately the conditions attending the operation of the Utah mill have been such that its shortcomings cannot be ascribed wholly to features of its design and the relative merits of the two systems of crushing have not been determined as it was expected they would be.

Mill-men are nearly a unit nowadays in condemning the stamp as a crushing machine for ore-dressing purposes, except the steam stamp which has survived under the peculiar conditions of Lake Superior, and possibly the Nissen stamp. The recognition of the latter as a possibility is based upon its large and cylindrical screening surface which gives the particles of ore increased chances to escape from the mortar and thereby reduces the danger of sliming. On the other hand the chile mill is a notorious slimer. It is indeed a great problem among mill men to decide upon a type of regrinding machine that is not a bad slimer, the Huntington mill also being open to serious objection on that ground. It may be that the advantages of tube mills and ball mills have not been sufficently considered in those cases where comparatively fine grinding is required. However, for those who desire to adhere closely to the lines of conventional practice there is a standard and meritorious machine that can well be substituted for the chile and Huntington mills. This is the rigid roll, which already finds successful employment in the mills of Lake Superior and elsewhere. We understand that the new Miami mill is also to employ them and it seems to us that its engineers are taking a step in the right direction.

The Silver-Lead Mines of the Coeur d'Alene

The mines of the Cœur d'Alene, one of the great lead-producing districts of America, are concentrated in a few hands. The most important are the Federal Mining and Smelting Company, controlled by the American Smelting and Refining Company, which owns a number of mines, and the Bunker Hill & Sullivan Mining and Concentrating Company, which owns only one mine, but that one the richest and most cheaply operated of the whole district. Outside of these companies the Hecla Mining Company and the Hercules (owned by a partnership) are important producers and there a few others of minor consequence. It will be gathered from this that the Cœur d'Alene is still, as indeed it has always been, a field of operation for companies with considerable capital rather than for the small miner. This is chiefly because the ore shoots are of low grade as a rule, requiring the erection of dressing works before they can be made productive, but there are exceptions as witness the Hercules, one of the more recent discoveries, which had large bodies of shipping ore.

It is the hope of every prospector to find another Hercules. There is a good deal of prospecting going on in the district all the time. Viewing the densely wooded character of the hill-sides, which may hide the outcrops of many veins, and recognizing moreover that most of the veins of this district were poor at the surface, anyone will be free to admit that the chances have by no means been exhausted and that new veins of concentrating ore, perhaps another Hercules, perhaps even an Atlas, may yet be discovered.

Eastern Iron Ore Supplies

Reports of sales of merchant ores from the Lake Superior region for the coming season, all agree that the eastern furnaces have been lighter buyers than usual Most eastern blast furnaces use some quantity of Lake ore for a mixture with local ores, though complaints have been made of their high cost, which is due to the railroad freights from Lake Erie ports. It does not appear that the light buying is due to any anticipation of poor business, but rather to a disposition to look elsewhere for ore supplies. In 1909 there was a marked increase in activity in eastern iron mines. This was manifested chiefly in the Lake Champlain, the Adirondack and the Hudson river districts in New York, in New Jersey and in eastern Pennsylvania.

Another source of supply is found in increased imports. The recent large developments in Cuba have an important bearing upon this movement; but some furnaces are looking further. The imports of iron ore in 1907, an active year, were 1,229,168 tons; in 1908 there was a heavy drop, as might have been expected, the total being 776,898 tons; in 1909 there was an increase to 1,696,411 tons, or one-third more than the total of 1907. For a number of years past the quantity of iron ore imported has averaged about 3 per cent. of the Lake production, but last year it was about 5 per cent. A careful study by B. S. Stephenson, in the Cleveland *Iron Trade Review* puts the probable imports for 1910 at over 3,000,000 tons. On the basis of contracts known to have been already closed 1,500,000 tons of ore will come from Cuba; 700,000 tons from Spain; 300,000 from Sweden; 100,000 from Algeria; 50,000 from Greece; and 350,000 tons from Newfoundland. Cuba and Newfoundland are familiar sources of supply; Spain also to a smaller extent. Sweden and Algeria, however are comparatively new fields, so far as our ironmakers are concerned. A large part of the Cuban ore will be taken by the Bethlehem and the Pennsylvania Steel companies, which control the deposits in the island; but there is a surplus for sale to eastern merchant furnaces, of a quality which will take the place of the more expensive Lake ores.

Two causes contribute to this increased importation, besides the higher cost of Lake ores. One is the reduction of the duty on iron ores from 40c. to 15c. —or to 12c. in the case of Cuban ores. Another is that ocean freights are low, and promise to continue so for some time. Moreover, the ocean transportation of ore has been in recent years reduced to a system and improved by the use of steamers especially built for the trade, on plans approaching as nearly as ocean conditions will permit our large Lake ore carriers. The Cuban mines and the larger Swedish and Spanish mines now control their own fleets, and can contract for deliveries without reckoning with possible variations in freight rates.

The existence of large contracts for ore indicates that eastern furnaces look for an active year, and that they intend to hold their own against competition from the Central West. Railroad freight rates form a barrier which prevents any ore from the seaboard from going west of the Alleghenies. The activity in eastern mines and in foreign ores depends entirely on the demand from Eastern furnaces.

DETAILS OF PRACTICAL MINING

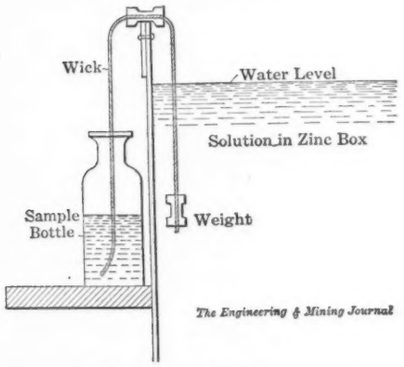
NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES — THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Device for Sampling Zinc-box Solutions

BY FRED. W. MONAHAN*

An ingenious and useful method of sampling the solution in the last zinc box in cyanide mills is shown in the accompanying sketch. It consists of a cotton wick with one end in the zinc-box solution and the other in the bottle to receive the sample. The wick passes through a porcelain insulator on the edge of the box, and has another insulator attached to the end to act as a weight. The bottle is set below the level of the water in the zinc box and the wick continuously siphons a small amount of the solution over into the bottle, thus taking a uniform and accurate sample.



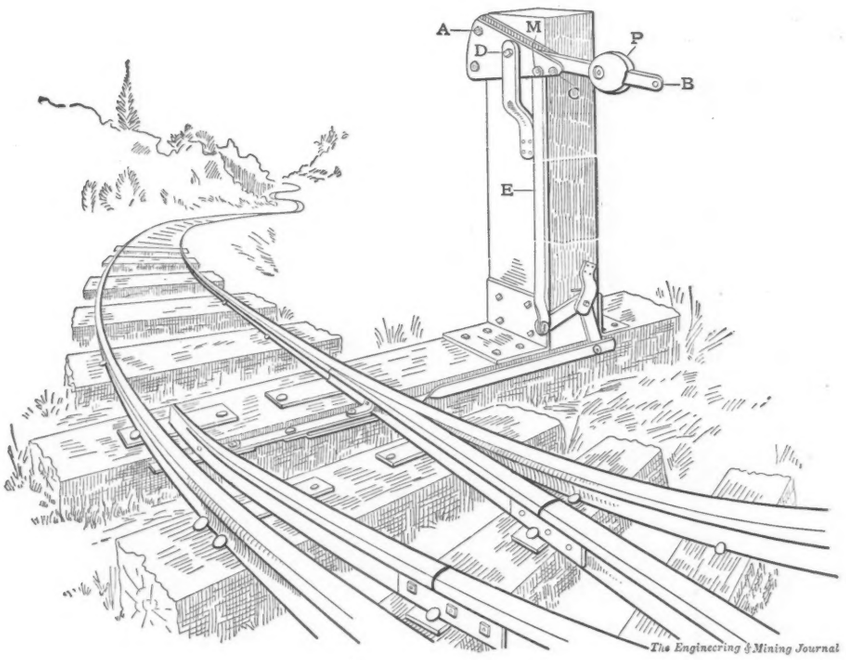
SAMPLING CYANIDE SOLUTION IN ZINC BOX

The samples are collected each day and tested for any trace of gold which may have passed the zinc shavings. This is a much more accurate method than to have the boy who bucks the samples go around and take out a dipperful now and then. It is also a means of checking and often preventing large losses due to careless treatment of the zinc shavings.

*Atlas block, Salt Lake City, Utah.

A Convenient Switch-throwing Device

The switch-throwing device shown in the accompanying drawing is in use at the Homestake mine, and is made at Newport News, Va., by Peter H. Petersen, a former employee of that company. The function of the apparatus is to permit the switch being set in either position: when trailing a closed switch no adjustment is necessary, the action being automatic; and when facing it, the required adjustment can be made by the engineer from the train.



THE PETERSEN SWITCH

The device consists of a triangular lever box composed of two plates spaced by roller-shaped fillers on the bolts, and pivoted at *D*. The switch rails are connected to this lever box through a bell crank and bar *E*, which is pivoted at the bolt *M*. The gravity lever *B* with weight *P* is pivoted between the plates at *D*. When *B* is in the position shown, it rests on bolt *C* and holds the switch points against the right-hand rail, thus keeping the left-hand track open. When *B* is thrown over center, it rests on bolt *A*, raising *E* and holding the points in the opposite position.

When trailing a closed switch, no matter for which track it is closed, the switch points will open to let the cars pass through and adjust themselves again to their former position after the last car has passed over them. The engineer or motorman can throw the lever to set the switch for either track he desires while his locomotive is passing over the switch points.

When facing a switch, should it be placed wrong, the engineer drives to the throw, adjusts it to suit, and then moves off the switch points, whereupon the weight sets the switch to its new position. Or a rope may be attached to *B*, run through a pulley directly over the pivot *D* and extended to any point along the track, permitting the engineer to set his switch as he approaches it. Thus no switchman or extra trainman is necessary.

It is announced by a British consul that a radium factory is being started at Lidingö, one of the suburbs of Stockholm, Sweden. The company hopes to have a factory which will employ about 120 men ready in a few months, and expects to produce 4½ grams of radium per year.

Using the Ore Bucket

By S. A. Worcester*

While the mining bucket as a device for tramming and hoisting rock is no doubt crude, it has the important merits of simplicity, cheapness and minimum dead weight and is probably the best appliance available for handling, say, up to 30 or 40 tons per shift while prospecting and developing or doing other temporary work. In some cases a much larger tonnage may be handled with good economy, provided that proper conveniences are used for handling, filling and dumping the bucket. It can be used in crooked shafts, either vertical or inclined, or partly both. Where the law permits, it may be used without guides or crosshead and is therefore a cheap arrangement.

The bucket is filled either from chutes when stoping, or with the shovel when sinking or drifting. Its relatively small diameter causes a good deal of spilling when it is filled from chutes. Filling with the shovel is easier with the bucket lying on its side, as shown in Fig. 1, than when upright. The sidewise position has the advantage that when hoisting away the bucket tends to upset the truck.

The arrangement shown in Fig. 2 is perhaps the most economical method of bucket filling now in use. The bucket is not detached from the cable and is automatically guided to the loading place and requires no attention from the trammer when hoisting away. The length of the car being much greater than the width of the loading chute prevents spilling, and a short spout with converging sides prevents spilling when loading the bucket.

For dumping buckets at the surface the hand-operated hook, engaging a ring on the bottom of the bucket, as shown in Fig. 1, is still used in many places. Perhaps the simplest form of bucket dumper which can be operated by the engineer without leaving the hoist is that shown in Fig. 3 and is useful only for dumping water. The bucket is lowered on the closed door, which upests it, pouring the water into the trough. The bucket is then raised to clear and the door opened with a cord or rope.

Three different styles of ore dumpers, operated by the engineer (two of them patented), are in use in the Cripple Creek district. Fig. 4 shows the apron dumper. The swinging apron shown hangs normally in the dotted position, its swing being limited by two chains at the upper corners. After the rising loaded bucket passes, the apron swings beneath the bucket. The bucket is then lowered and upsets on the apron. As it slides down to the full-line position, the ball or button at the end of the chain is caught in a Y-shaped notch in the upper edge of the apron. When the bucket is emptied and again raised, the apron is swung clear, using the cord and pulley shown, and allowing the bucket to be lowered.

This dumper has the merit of turning the bucket away from the shaft so that there is seldom any rock spilled in the shaft. It is the most expensive of the auto-dumpers and has the disadvantages of requiring special framing and concealing the bucket so that the engineer cannot see whether it is dumped clean or not. As it does not invert the bucket completely, rock hangs oftener with it than with other dumpers.

The looped-rod dumper shown in Fig. 5 is a cheap and simple device which inverts the bucket completely, turning it toward the shaft. The looped rod is swung up beneath the bucket, as shown by the dotted lines, using the pull rod shown. As the bucket lowers, the button catches in the loop and suspends the bucket, bottom up.

The cord and pulley dumper, Fig. 6, is about the cheapest device possible. Its operation is similar to that of the looped rod, but the loop in this case is the short forging shown in the detailed side view, and is suspended from the ordinary dumping rope or chain, engaging the button and performing the same function that the ordinary dumping hook shown in Fig. 1 does. The two cords shown in the detail run from the loop to the two

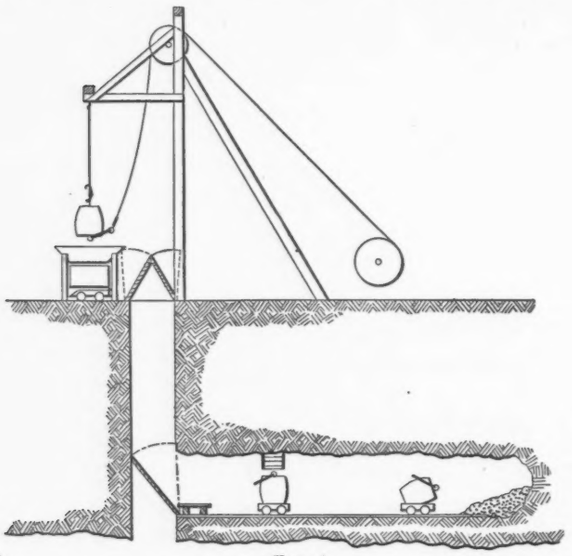


Fig. 1

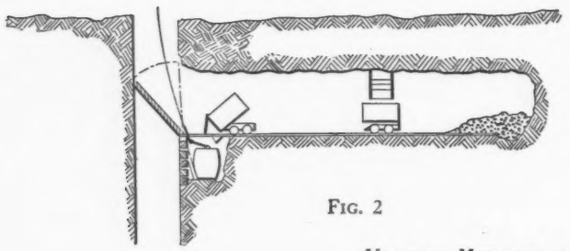


Fig. 2

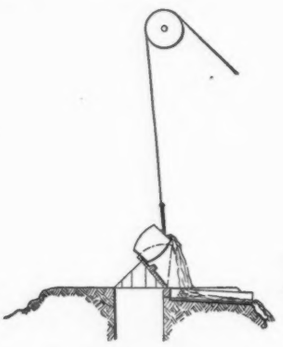


Fig. 3

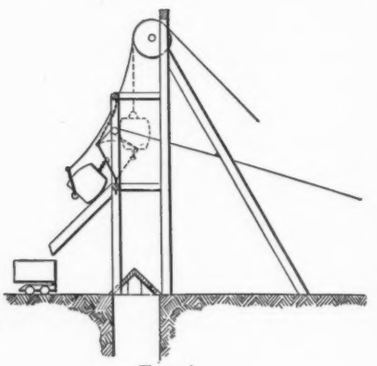


Fig. 4

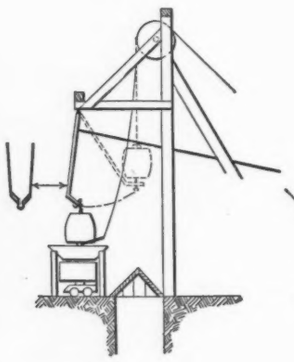


Fig. 5

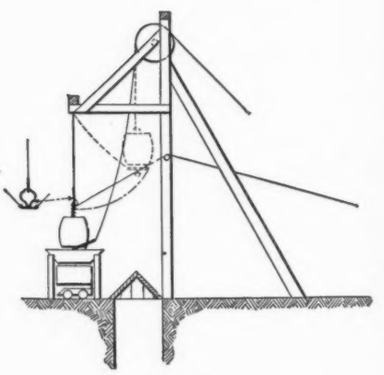


Fig. 6

The Engineering & Mining Journal

Various Methods of Filling and Dumping Buckets

*Mechanical engineer, Victor, Colo.

posts of the gallows frame, where they pass through pulleys and are joined in one cord passing to the hoist. This cord is used to pull the loop over the button, and the dumping operation is like that of Fig. 5. The shaft doors for all of these dumpers are opened and closed by cord and pulley arrangements, or by rod devices of some simple description.

Rapid Method of Determining Copper in Slags

By A. W. Diack and Thorn Smith*

The article by F. D. Aller in the Journal of Dec. 25 is interesting and valuable to the chemist desiring to secure the best results. It is well known to careful chemists that, working on the usual one-gram sample of low slag, good results are not the rule. The time required to prepare the copper for its final estimation when using the ordinary methods is too long. If it is desired to use five or more grams of the sample, the silica present is so excessive and difficult to wash free from copper that one is inclined to give it up as a bad job.

The usual method is to precipitate the copper on aluminum after removing the silica. To get the copper into solution it is necessary to treat the original sample with nitric acid. This oxidizes the iron, and before the copper will completely precipitate on the aluminum it is necessary to reduce the ferric iron. We have known reputable chemists to boil such a solution for two and even three hours.

Mr. Aller's method shortens the time to a fraction of that ordinarily required, but is open to two criticisms: (1) Does he succeed in precipitating all of the copper on aluminum? (2) Will not the slight amount of gelatinous silica, which we have found almost invariably present, interfere with the filtration, assuming as we do that most chemists will prefer to decant through a filter paper?

It is the experience of many chemists that some copper remains in solution and it is customary to add hydrogen sulphide before filtering.

Our method, which is in use in many smeltery laboratories, was devised a year or two after Mr. Aller's, we then believing it to be original. The main idea is the same but we depart slightly after dissolving the slag.

Any Size Sample May Be Used

Briefly, we take 5, 10, or 20 grams as desired, place in a 600-c.c. beaker, add 300 c.c. water, preferably boiling hot, and bring to a boil. With constant stirring add 15 c.c. hydrochloric acid, a few c.c. at a time to prevent boiling over from violent action. Continue to boil until apparent action has ceased, which does not require over three minutes. The beaker is then removed from the source of heat and a rapid stream of hydrogen sulphide run into it to precipitate the copper that has gone into solution. As but a fraction of the copper is dissolved and the iron is mostly in the ferrous condition, it is not necessary to use the hydrogen sulphide more than five minutes, in fact two minutes is generally sufficient.

A porcelain Gooch crucible, in one piece, is fitted with a double disk of filter paper, attached to the pump in any suitable manner and the solution rapidly filtered and washed two or three times with hydrogen-sulphide water. The tendency of the gelatinous silica to clog the paper is overcome by the addition of a few drops of hydrofluoric acid directly to the solution in the Gooch, every time the solution ceases to flow rapidly. If too much acid is added the filtering practically ceases, hence it is advisable to use a 1:4 solution and add gradually. No effort is made to remove the main precipitate from the original beaker; in fact it is preferable to retain as much as possible therein.

Remove the Gooch from the pump and poke out the paper disks with a glass rod or platinum wire into a 250-c.c. beaker. Add 5 or 10 c.c. nitric acid to the large beaker, cover and boil until the sulphides are in solution. Then pour through the Gooch into the smaller beaker. Rinse the large beaker with bromine water, pouring through the Gooch into the small beaker. Two washings with bromine water are sufficient. Cover the small beaker and boil free from bromine, filter and determine the copper by any method, electrolytic preferred.

As in Mr. Aller's method, there will be an insoluble residue of matter, magnetic oxide, silica, etc., but no copper will escape solution in the final treatment with nitric acid and bromine. The time required is no longer than with Mr. Aller's scheme, and is much shorter than any other method where ordinary accuracy is required.

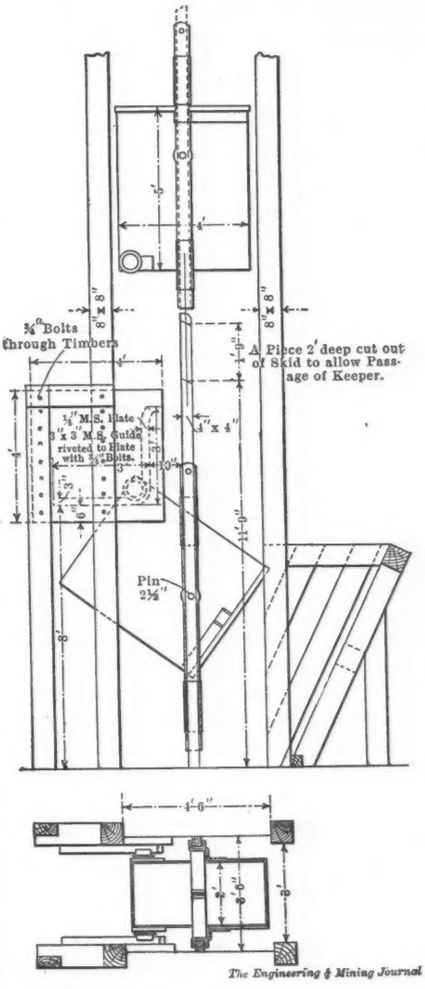
We believe our method has two distinct advantages over Mr. Aller's; we are sure the copper is all precipitated, and by filtering through a Gooch we are positive that no copper escapes mechanically. We have for years used the Gooch as above for filtering the copper in mattes, precipitated on aluminum in the usual manner, particularly when using the cyanide method for furnace control.

It is not our intent to critisize Mr. Aller's method unfavorably but merely to add our experience that the thinking chemist can adopt a method suited to his material.

*Chemical engineers, 33 Mullett street, Detroit, Mich.

Arrangement of Self-dumping Underground Skip

An arrangement for discharging a self-dumping skip at the bottom of a winze or shaft is illustrated in the accompanying drawing. The tipping arrangement permits the complete operation of discharging within limited head-room. The guide wheels on the skip engage with 3-in. square mild-steel guides. When lowering a full skip and discharging, the operation is positive and complete. The whole


¾" Bolts through Timbers
A Piece 2' deep cut out of Skid to allow Passage of Keeper.
¼" M.S. Plate
3" x 3" M.S. Guide riveted to Plate with ¾" Bolts.
4" x 4"
Pin 2½"
4'-0"
The Engineering & Mining Journal

Arrangement of Self-dumping Skip

weight of the skip when discharged is carried by the steel guides, and the engineer at the surface knows by the release of the weight from the rope, that the skip has reached its maximum discharge position.

This scheme is used at the South Kalgurli gold mine, as reported by the *Monthly Journ.* of the Chamber of Mines of Western Australia, Sept. 30, 1909. It might be successfully adopted wherever it is desirable to drop all the material mined from a series of workings into a pocket or ore bin, whence it is to be trammed or hoisted through another opening.

Working Costs of West African Mines

SPECIAL CORRESPONDENCE

The three leading producing companies on the Gold Coast, West Africa, the Ashanti goldfields, the Taquah and the Abosso, have now issued their reports for the financial year ended June 30, 1909. It is of interest to compare the latest costs with those of the preceding year with a view to seeing what reductions are being made.

The best showing is that of the Ashanti Goldfields, costs having been reduced about 5s. ($1.22) per ton of 2000 lb.

COMPARATIVE COSTS ON THE GOLD COAST.

	Period Year Ended.	Tons (2000 lb.) Milled.	Yield per Ton, Shillings.	Total Costs, Shillings.
Ashanti Goldfields.....	June, 1908	66,254	52.2	36.4
Ashanti Goldfields.....	June, 1909	78,786	44.0	31.3
Abosso	June, 1908	44,021	50.4	39.0
Abosso	June, 1909	60,702	45.6	37.6
Taquah	June, 1908	46,234	60.0	48.3
Taquah	June, 1909	56,793	55.6	55.7

Abosso shows a reduction of 2s. per ton, but it must be noted that the tonnage crushed was considerably in excess of that previously crushed, as was also the case at the Ashanti Goldfields. At the Taquah, on the other hand, the costs, which were already high for the year ended June, 1908, show a considerable increase during that ended June 30, 1909; a result attributed to floods and engineering difficulties. The costs given in the accompanying table embrace not only operating costs at the mine, but general expenditure in London and the amount written off for depreciation of plant and machinery.

The costs of the Ashanti Goldfields for the year ended June 30, 1908, are made up of 22.3s. ($5.43) per short ton (2000 lb.) for mining, milling and general charges, and of 14.1s. ($3.43) per ton for freight on bullion, government royalty, general expenses in London, mine development and depreciation of plant and machinery. The corresponding figures for 1908-9 were 21.4s. ($5.20) and 10s. ($2.43). It should also be noted that of the tonnage milled, about one-sixth was derived from a quarry where the mining costs were comparatively low.

The Abosso costs for 1907-8 included a development charge of 5.25s. ($1.28) per ton and a depreciation charge of 4.4s. ($1.07) per ton. In 1908-9 these items were 4.5s. ($1.09) and 3.6s. ($0.88) per ton respectively. The Taquah costs for 1907-8 include 6.5s. ($1.58) for development and 6.2s. ($1.50) for depreciation. For 1908-9 the development charge was the same, but depreciation amounted to 8s. ($1.95) per ton milled.

Nevada Consolidated-Utah Copper Company

The time for the deposit of Nevada shares in exchange for Utah expired March 5. There has not yet been any official announcement. In the newspapers the Utah management has been claiming that 950,000 Nevada shares have been turned in for exchange, while James Phillips, Jr., says that the number is not over 900,000 and that some of the stock deposited will be withdrawn. Reading between the lines it appears that the Utah Copper Company lacks an actual majority, but nevertheless it will probably control Nevada by its ownership of so large a block inasmuch as the opposition will find it difficult to concentrate their scattered holdings, and it is said that C. M. MacNeill and D. C. Jackling will be put on the Nevada board, replacing two of the Guggenheim directors.

We are inclined to believe that the Utah Copper Company holds about the number of Nevada shares that it claims.

California Oil

SPECIAL CORRESPONDENCE

Recent oil strikes in the Midway-Sunset districts of Kern county lead some of the oil men of the State to predict that the section in that vicinity will soon eclipse all others as an oil-producing region. Lands bought a few months since from the Government for $1.25 per acre are now held at over $1500 per acre. Such are the crowds of people going there that the hotels and restaurants of Bakersfield and Maricopa are overcrowded and shacks and tents are being put up to house newcomers. The K. T. & O. gusher No. 28, adjoining the town of Maricopa, at 970 ft. depth began producing at the rate of 3000 bbl. daily and then began spouting at the rate of 6000 to 7000 bbl. If reports be true, it is now yielding from 10,000 to 12,000 bbl. daily. It has kept the owners on the rush to provide storage for the accumulated oil.

The San Francisco Chamber of Commerce is aiding the oil men by petitioning the Tokio Chamber of Commerce to urge upon the Japanese lawmakers who are now discussing the tariff, to move for a reduction on the rate of duty on California oil. Owing to increased duty the Japanese have quit buying California oil, although they were formerly extensive and regular purchasers.

An invitation has been extended to the managers of all oil refineries in California to meet at Bakersfield on March 1, the date upon which the oil producers are to discuss the question of the "closed door" policy for the independent oil agencies.

The question to come up is the combining of all the oil refineries of the State on the same lines as have proved so beneficial to the oil producers. At present, in order to compete with each other, California asphalt makers at the refineries are turning out an article in many instances low in grade, thus bringing a bad reputation on the State's paving material. The idea of the refiners is to increase the prevailing price for asphalt so that a better grade can be profitably made.

Litigation Over the Zinc Schedule

The American Smelting and Refining Company through its subsidiary, the Consolidated Kansas City Smelting and Refining Company, has brought an action before the Board of U. S. General Appraisers for the determination of the legality of paragraphs 181 and 193 of the Payne-Aldrich tariff, under which the Treasury Department is collecting duty upon the zinc contents of lead ores. In a statement given out March 1 the attorneys for the plaintiff say:

"We claim broadly that the Treasury Department has no right to assess duty on the same merchandise under two entirely different paragraphs of the act of 1909. The Government must elect which one of the two provisions duty is to be taken under. If the act provided for the assessment of duty on lead on the one hand, and again for the assessment of duty on zinc, this issue would not arise. But the law has specifically provided for the imposition of separate duties on these two commodities. We claim that the ore cannot be lead-bearing ore and a zinc-bearing ore at the same time. It must be one classification or the other."

Agreement of Power Companies in Mexico

The Chapala Hydro-Electric and Irrigation Company, of Guadalajara, and the Guanajuato Power and Electric Company, of Guanajuato, have agreed on a division of territory. The former will transmit power to Aguascalientes and Zacatecas and mining districts in those states, and the latter will transmit to San Luis Potosi and adjacent mining camps. Transmission line to Aguascalientes and Zacatecas will be started with a few months, and cost will be 1,500,000 pesos. Line to Aguascalientes will be 180 km., and from that point to Zacatecas 125 kilometers.

American Institute of Mining Engineers

Ninety-eighth Meeting Held at Pittsburg. Members and Guests Present 350; Many Valuable Papers Read and Discussed. Steel Plants Visited

BY JOSEPH STRUTHERS*

The ninety-eighth meeting of the American Institute of Mining Engineers was held at Pittsburg, Penn., from March 1 to 4, 1910. The institute headquarters was at the Hotel Schenley, where a bureau of information was maintained during the meeting for the benefit of the visiting members and guests. R. C. Crawford was chairman and H. W. Craver, secretary of the local committee. Mr. Craver was indefatigable in looking after the comfort and convenience of the party.

The ladies committee, of which Mrs. Taylor Alderdice was chairman, intertained most hospitably the ladies of the institute party.

Many pleasing and instructive excursions were made, notably to the art galleries and museum of Carnegie Institute; luncheon at the Allegheny County Club; the Margaret Morrison Carnegie School, which is the woman's department of the Carnegie Technical School; the famous pickle plant of H. J. Heinz Company; and other places of interest in the city and environs.

The Opening Session

The opening session on Tuesday evening, March 1, was held in the large lecture hall of the Carnegie Institute, Pres. David W. Brunton presiding. Harrison W. Craver, secretary of the local committee, introduced Dr. John A. Brashear, who delivered the welcoming address, to which President Brunton responded.

Dr. R. W. Raymond presented in oral abstract the biographical notice of the late Dr. Charles B. Dudley, which will be published in full in the *Bulletin* of the institution. Col. H. P. Bope gave an earnest eulogy of the late William Metcalf, whose name has been so prominently identified with the progress and development of the iron and steel industries of Pittsburg.

Prof. Robert H. Richards, past president of the institute, presented an interesting paper on the "Development of Hindered Settling Apparatus," clearly illustrated by lantern slides.

The session concluded with a brief description by L. T. Beyl of the mining districts of the Argentine Republic, illustrated by many lantern photographic views.

On Wednesday morning, March 2, the second session, at the same place, was called to order by President Brunton. The following papers were presented in oral abstract by the authors:

"Systematic Exploitation in the Pittsburg Coal Seam," by F. Z. Schillenberg and Edward McGrew, Pittsburg, Penn. Discussed by Frank W. De Wolf, geologist of the Illinois State Geological Survey.

"A Commercial Fuel-Briquetting Plant," by William H. Blauvelt, Syracuse, N. Y. Discussed by C. W. Malcolmson, Chicago, Ill.; E. W. Parker, U. S. Geological Survey and J. Birkinbine, of Philadelphia, Penn.

"Dust Explosions in Coal Mines," by George Samuel Rice, Pittsburg, Penn.

"The Gaseous Decomposition Products of Black Powder," by C. M. Young, Lawrence, Kan.

"Work of the Technologic Branch of the U. S. Geological Survey at Pittsburg, Penn., by Dr. Joseph A. Holmes, Washington, D. C.

Wednesday afternoon was devoted to a visit to the testing station of the U. S. Geological Survey at Arsenal park. Through the courtesy of the engineers of the Technologic Branch of the survey a party of about 100 members and guests visited the station and viewed the tests that were made to illustrate the work that is now being done.

Wednesday evening's session was held in the lecture hall, and the following papers presented by the authors in oral abstract:

"Accumulation of Petroleum in the Earth," by David T. Day, Washington, D. C.

"The School of Mines at the Pittsburg University," by M. E. Wadsworth, Pittsburg, Penn.

"The Technical Schools of the Carnegie Institution," by Fred Crabtree, Pittsburg, Penn.

New Cyanide Method

"A New Method of Cyaniding Gold and Silver Ores," by E. Gybbon Spilsbury, New York. Mr. Spilsbury described the use of a silica sponge in the form of a diaphragm which is placed as a false bottom in the ordinary filter tank used for the cyanidation of gold and silver ores. The sponge is specially prepared in the form of slabs 12x12 in., and 12x20 in., supported on bricks, and calked with oakum and liquid cement. The pores of the slab are so minute that while air will readily pass through, no solids whatever can penetrate the slab.

In practice, the tank is filled with ore and solution in the usual way and air at a pressure of from 2 to 6 lb. per sq.ft. is introduced in the channels below the diaphragm, the resultant agitation by the minute air globules is so thorough that the time of treatment is reduced to about 6 hours, and the consumption of cyanide is much less than that of the Pachuca tank or of processes having mechanical agitators. Mr. Spilsbury quoted the results of many tests among which, as an example is the following:

A gold-silver ore assaying $14.53 per ton gave, after one hour of treatment an extraction of 97.9 per cent. of the gold and 51.7 per cent. of the silver; after 2 hours, 99 per cent. and 69 per cent.; and after 12 hours, 99 per cent. and 84.8 per cent. respectively.

"The Dwight and Lloyd Sintering Process," by Arthur S. Dwight, New York. Mr. Dwight described the process in the present state of its development as applied to the sintering of fine lead ores, and gave many lantern views of furnaces now in operation, and plans of various installations. This process was described in the JOURNAL, March 28, 1908, and in "The Mineral Industry," Vol. XVI, but considerable advance has been made since these articles were published, which Mr. Dwight dwelt especially upon in his remarks.

Steel Works Visited

On Thursday morning, through the courtesy of the Carnegie Steel Company, a party of about 100 visited the steel works at Homestead. A brief trip was made through the Carrie furnace plant and the party then proceeded by train back to Newhall where a welcome and delightful luncheon was given in the Firemen's hall, presided over by Col. A. R. Hunt, of the Carnegie Steel Company. The remainder of the afternoon was devoted to special trips to the electric steel furnace of the Carnegie Steel Company and the plant of the Mesta Machine Company.

While the institute party was visiting the steel plant, the ladies, in charge of the ladies' local committee, visited the famous pickle plant of the H. J. Heinz Company, where they were entertained at luncheon. On Thursday evening a reception, dance and collation were given in the ball-room of the Hotel Schenley.

On Friday morning, the fourth and concluding session was held. The following papers were presented:

*Assistant secretary, American Institute of Mining Engineers, New York.

"The Huronian as a Gold-bearing Terrane," by Robert Bell, Ottawa, Can.

"The Action of Explosives in Rocks of Different Degrees of Hardness," by W. O. Snelling, Pittsburg, Penn.

"History of the Introduction of Basic Steel in the United States," by George W. Maynard, New York.

"Electric Mine Hoists," by Karl A. Panly, Schenectady, N. Y.

"Field Investigations of Structural Materials for Use in Federal Buildings," by E. F. Burchard, Washington, D. C.

"Coal and Iron Ore in Western Oaxaca, Mexico," by J. L. W. Birkinbine, Mexico, D. F.

"The Chemical Control of Slimes," by Harrison E. Ashley, Pittsburg, Penn.

PAPERS READ BY TITLE

The following papers were presented, to be read by title for subsequent publication in the *Bulletin* of the Institute:

"Combustion in Cement Burning," by Byron E. Eldrid, Tuckahoe, N. Y.

"A Method of Calculating Sinking Funds, and a Table of Values for Ordinary Periods and Rates of Interest," by John B. Dilworth, Philadelphia, Penn.

"Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico," by George A. Tweedy and Roger L. Beals, Rosario, Sinaloa, Mexico.

"The Copper Provinces of the United States," by William H. Emmons, Chicago, Ill.

"The Behavior of Copper Slags in the Electric Furnace," by Lewis T. Wright, San Francisco, Cal.

"Chemical Laboratories in Iron and Steel Works," by George W. Maynard, New York.

"Notes on Fields Methods of Assaying, i.e., an Assay Shop in an Ordinary Valise," by S. K. Bradford, National, Nev.

"The Girod Electric Furnace, and the French Works Using the Paul Girod Steel Process," by Wilhelm Borchers, Aachen, Germany.

"Electricity in Mines," by William Kelly, Vulcan, Mich.

"A New Separator for the Removal of Slate from Coal," by W. S. Ayres, Hazelton, Penn.

"Improvements in Blast Roasting," by Herbert Haas, San Francisco, Cal.

"Ultimate Source of Ores," by Charles R. Keyes, Des Moines, Iowa.

"The Genesis of the Leadville Ore Deposits," by Max Boehmer, Denver, Colo.

"Heats of Formation of Some Ferrocalcic Singulo-silicates, by H. O. Hofman and C. Y. Wen, Boston, Mass.

"Professional Ethics," by R. W. Raymond, New York.

"Application of Descriptive Geometry to Mining Problems," by Joseph W. Roe, New Haven, Conn.

"The Behavior of Copper Mattes and Copper-nickel Mattes in the Bessemer Converter," by D. H. Browne, Copper Cliff, Ontario, Can.

"Mining Conditions in the Belgian Congo," by Sydney H. Ball, New York, and Millard K. Shaler, Lawrence, Kan.

"An Investigation of the Sampling of Anode Copper, with Special Reference to Silver Content, at the Washoe Smelter, Anaconda, Mont.," by William Wraith, Anaconda, Mont.

"The Giroux Shaft," by Everard Arnold, Kimberly, Nev.

"The Gaseous Decomposition Products of Black Powder," by C. M. Young, Lawrence, Kan.

"Deacidifying Furnace Gases," by F. T. Havard, Madison, Wis.

"The Combustion Temperature of Carbon and its Relation to Blast-Furnace Phenomena," by Clarence P. Lineville, State College, Penn.

"The Fushun Colliery, South Manchuria," by Warden A. Moller, Tientsin, China.

"Federal Coal Mines in the Philippines," by Oscar H. Reinholt, Pasadena, Cal.

"Professional Ethics," by Victor G. Hills, Denver, Col.

During the sessions an exceedingly good portrait in oil by Farley, of Philadelphia, of the late Thomas M. Drown, the first secretary of the institute, was on exhibition in the lecture hall. About 350 members and guests attended the sessions, and the various excursions.

Sonoma Magnesite Company

The Sonoma Magnesite Company, of Philadelphia, Penn., capitalized at $1,000,000, divided into 100,000 shares of $10 each, is offering a portion of its treasury stock at $10 per share. The company claims to own a very large deposit of high-grade magnesite and is now raising money to construct about 12 miles of narrow-gage railroad to connect with the Northwestern Pacific Railroad at Watson, Cal., to build kilns, calcining and grinding plants and for additional working capital. The estimated cost of the railroad is $100,000; plant of 100 tons daily capacity, $50,000; working capital, $100,000. It is claimed that upon completion of the railroad magnesite can be quarried, calcined and ground, and delivered at $4 per ton at San Francisco, or $10 per ton by ship at New York. Upon a business of 30,000 tons per annum (it is stated that the market will take double or more than this tonnage) on a basis of $20 per ton ("as against the trade quotations of $27.50 to $30 per ton" says the prospectus) a profit of $300,000 per year is estimated.

As to the extent and character of the deposits owned by this company, we do not know, but with respect to its statements as to market conditions, we quote in the interest of prospective investors from "The Mineral Industry," Vol. XVII, slightly condensing, as follows:

The only important deposits of magnesite in the United States are in California, mainly in the Coast Range. But few of them are worked. The consumption on the Pacific coast is small, and the high cost of transportation to the Atlantic seaboard prevents competition with the mineral imported there from Austria and Greece. Even to supply the small consumption of the Pacific coast only those deposits that are close to railways can be profitably worked. The annual production of California is 7000 to 9000 tons, worth from $3 to $3.50 at the mines. The bulk of the production is made by the Willamette Paper and Pulp Company at Porterville, Tulare county.

According to F. L. Hess, of the U. S. Geological Survey, none of the California veins compares well in size with the reported width of the Hungarian veins. In quality, however, the comparison with the foreign material is favorable; in fact, the California article is ordinarily better.

Magnesite from Sonoma and Napa counties can probably be calcined and delivered in San Francisco at $15 per 2000 lb. Imported calcined magnesite was quoted in New York in April, 1908, at $16.75 to $25 per 2000 lb., and when comparatively free from lime, ground, sells in small lots at the latter price. Mr. Hess expressed the opinion that with this difference in price for calcined magnesite of $5 to $6 between San Francisco and New York, it seems possible that this product could sometimes be shipped at a profit to the Eastern coast of the United States on vessels that would otherwise sail without a full cargo, and would for this reason be willing to carry the material at low rates.

According to a communication from the Willamette Paper and Pulp Company, its production from December, 1904, to May 9, 1908, was 14,241 tons of raw magnesite, which yielded 5888 tons of calcined. The raw material cost $4.93 per ton f.o.b. cars at Porterville, while the calcined cost $18.99 per ton delivered at San Francisco.

According to "The Mineral Industry," Vol. XVII, the production of magnesite in California in 1908 was 8967 tons while the imports of foreign magnesite into the United States were 84,494 tons, the total consumption being 93,461 tons. The largest consumption on record was in 1907 when the amount was 105,413 tons.

The discrepancy between these statistics and those presented by the Sonoma Magnesite Company will be quite obvious. The California producers have been of the opinion that they cannot compete with the foreign mineral unless they are protected by a tariff, which last year they sought to obtain, but failed. The prospect for a California producer to capture nearly one-third of the domestic consumption and realize a profit of $10 per ton does not appear to be good.

The Canadian Mining Institute Meeting

Proceedings of the Twelfth Annual Meeting, at Toronto. A Large and Successful Meeting, with Many Valuable Papers and Interesting Discussions

EDITORIAL CORRESPONDENCE

The twelfth annual meeting began at Toronto, Ont., March 2, with a large attendance, 152 members being registered in the course of the meeting. After a brief address of welcome from the city, with appropriate response, President Miller delivered his annual address. In this, after referring to the progress of mining during the year, he dwelt at considerable length on the mining laws of the Dominion and the several Provinces, urging revision and unification where possible. He referred to the excellence of the new mining law of Quebec in many respects. Other subjects referred to were the extension of railroads, the use of water powers, and accidents in mining.

The report of the Council showed that the total membership of the Institute was 935, including active, associate and student members. The total receipts during the year were $10,497, and the cash balance at the close was $1452. The report also referred at considerable length to the action taken by the council in appointing a committee to confer with the Committee on Mines and Mining of the Dominion Parliament. A number of conferences were held, and most of the suggestions made were embodied in the reports of the committee to Parliament on proposed legislation.

Mineral Production

J. McLeish then read a summary of his report on the Mineral Production of Canada in 1909. We hope to publish this valuable report in full. He was followed by Thomas W. Gibson, deputy minister of mines of Ontario, who stated that the value of the total mineral production of the Province during 1909 was $32,652,072. Of the total, $22,765,463 was the value of metallic production, and $9,886,609 that of non-metallic production. The former included 2042 oz. gold, 25,737,037 oz. silver 1533 tons cobalt, 13,907 tons nickel, 7933 tons of copper, 263,777 tons of iron ore, 407,013 tons of pig iron, and 895 tons of zinc ore. The silver output was the largest in the history of the Province.

Theodore C. Denis, superintendent of mines of Quebec, reported that the total value of the mineral production of that Province in 1909 was $5,424,808; asbestos being the largest item.

Business Meeting

The president appointed as scrutineers to count the votes cast for officers of the Institute, Frederick Hobart, of New York, and Prof. M. B. Baker, of Kingston, Ontario.

The report on the competition for the prizes offered for papers by student members stated that the Council had awarded the President's gold medal to N. L. Bowen, of the School of Mining, Kingston. In addition Mr. Bowen received a cash prize of $25; while cash prizes of $25 and $20, respectively, were awarded to E. P. Cowles, of McGill University, and G. J. Burland, of McGill University. The papers submitted by Messrs. King. Rider, Rutherford and White received honorable mention.

A rather sharp debate was caused by a resolution introduced by R. W. Brigstocke, of Cobalt, regarding certain statements made by Hon. Clifford Sifton, chairman of the Conservation Commission, in a recent speech, in which he referred to a supposed high percentage of accidents in Canadian mines. It was shown that these statements were based largely on a misunderstanding of the figures, and a resolution was finally passed expressing regret that the statements had been made, and looking to their correction.

The Afternoon Session

The afternoon session was devoted to the reading and discussion of papers. R. W. Brock, of Ottawa, Ontario, spoke on "The Necessity of Distinguishing Between Prospecting, Developing and Mining." His paper was really a plea for the elimination of the unscrupulous promoter from the mining industry. Other papers were: "Mining Engineers and Mining Institutes," by P. D. Kendall, of London, England; "The Helen Mine, Michipicoten, Ontario," by R. E. Seelye of Sault Ste. Marie, Ont.; "Iron Ores in Vancouver Island," by E. Linderman, of the Mines Department, Ottawa. All these papers were discussed, Dr. Brock's especially calling out considerable debate.

Electro-metallurgy

The evening session was devoted to electro-metallurgy, two papers being read: "Recent Developments in Electro-Siderurgy," by P. McN. Bennie, Niagara Falls, and "Steel from the Electric Furnace," by Dr. A. Stansfield, Montreal. Both papers were illustrated by lantern slides; both were exceedingly interesting and called out long discussions. Mr. Bennie's paper was a careful record of the actual present position of the electric furnace as a producer of iron and steel. He referred especially to the furnace now in operation at Heroult, Cal., and to the furnaces erected at Joliet, Ill., and Worcester, Mass., by the United States Steel Corporation.

Asbestos

The morning session on Thursday, March 3, was devoted largely to asbestos. Three papers were read on "The Origin of Asbestos," by Dr. A. E. Barlow, of Montreal; on "The Distributions of Chromite and Asbestos Deposits in the Eastern Townships of Quebec," by John A. Dresser, and on "Recent Developments in the Thetford Asbestos Region," by W. J. Woolsey, Thetford Mines, Quebec. All these papers were interesting and suggestive, and they called out extended debate on the geology and probable origin of asbestos and on the distribution of the serpentine and asbestos deposits which have been so important in the mining district of Quebec. A short paper on "Mining Literature," by Allen Greenwall, of London, England, was read and called out a discussion in which Doctor Wilmot, Professor Walker and Mr. Hobart took part.

Amendments to the By-laws

The afternoon session on Thursday opened by the presentation of a report by the committee appointed at the Montreal meeting in 1909 to consider amendments to the by-laws. Several of these, which were merely verbal improvements in the old by-laws, were passed. A strong debate arose on the most important of the amendments, which provided for an entirely new classification of the members, and for a restriction of full membership hereafter to persons possessing certain technical qualifications. This called out a sharp debate in which a number of members joined, the leading part being taken by Professor Haultain, Messrs. Cole, Brigstocke and Barlow. The amendment was voted down by a large majority, the feeling of the meeting being strongly and unmistakably in favor of continuing the institute on its present basis.

The remaining amendments were also of some importance, providing for certain geographical restrictions in the membership of council and for the appointment yearly of a nominating committee to which all nominations for membership should be referred and which should present yearly candidates for officers. This group of amendments was again rather sharply debated, Professor Porter and Messrs. Brown, Haultain, Barlow and Hobart taking the lead in the debate.

They were finally voted down, leaving the membership of council without restriction and the nomination of officers open, as for some years past.

Megantic Copper Mines

After the business had been completed, Dr. James Douglas, of New York, gave some interesting reminiscences of copper mining in Megantic county, coupled with some consideration of the possibilities of utilizing the low-grade ores of that region. He also gave an interesting account of the opening and history of the Eustis mines, the only mines at present operating in that region. Doctor Douglas thought that with modern methods and the utilization of the by-products several of the old mines now closed might be reopened with fair prospects of success. He was followed by J. W. Wilson, of Ottawa, who gave a description of the recent examinations made of a number of the old mines of the Megantic region.

The Evening Session

On Thursday evening, Dr. J. B. Irving, of New Haven, Conn., read a paper on the formation of ore deposits by replacing, which was illustrated by a number of lantern slides. At the conclusion of this paper the meeting resolved itself into a smoking concert, which was highly enjoyed by the members present and which was presided over by G. G. S. Lindsey, who enjoys the triple distinction of being eminent in coal mining, in the law and as an entertainer. In the course of the evening, a presentation of a very handsome testimonial was made to Major Leckie, who is the senior member of the institute both in period of membership and in age, and who has long enjoyed the honorary title of "Dean of the Institute."

The Friday Sessions

At the morning session on Friday, March 4, B. B. Lawrence, of New York, gave "Some reminiscenses of Two Well Known Mines." A paper on "Criteria of Downward Sulphide Enrichment" was read by F. L. Ransome, of Washington, D. C., and an exceedingly important and interesting paper on "Some Directions in Which Improvements in Concentration May be Looked For" was read by Prof. Robert H. Richards, of Boston. The time devoted to these papers prevented any extended discussion although many members made brief remarks on Professor Richards' paper.

On Friday afternoon, Dr. Heinrich Ries, of Ithaca, N. Y., read a long paper illustrated by a number of lantern slides, on the "Clays of Nova Scotia." This paper embodied the results of examinations made by him in the field during the past year for the geological survey in Nova Scotia and a portion on New Brunswick. The paper was followed with much interest and there was a debate of length.

Officers Elected

Following Doctor Ries' papers, the scrutineers reported that they had counted the ballots and that the following officers were elected for the ensuing year: President, Frank A. Adams, Montreal; vice-presidents A. B. W. Hodges, of Grand Forks, B. C., and R. W. Leonard, of St. Catherines, Ontario. Councilors, Arthur A. Cole, of Cobalt, Ont; Charles Fergie, of Montreal; J. B. Tyrrell, of Toronto; John A. Dresser, of Ottawa; G. G. S. Lindsey, of Toronto; O. E. S. Whiteside, of Coleman, Alberta; Selwyn G. Blaylock, of Moyle, B. C.; Robert A. Bryce, of Cobalt, Ont; R. A. Hopper, of Montreal, and John J. Penhale, of Sherbrooke, Quebec.

The Sifton Resolutions

Following this announcement, Doctor Porter somewhat unexpectedly brought up, as a question of privilege, a motion to rescind the resolution passed earlier in the meeting in relation to certain statements about mine accidents made in a speech by the chairman of the Conservation Commission. Although President Miller read a letter from Mr. Sifton, stating that he regretted that there had been any misunderstanding, a sharp debate arose, which was closed by a motion to lay the whole matter on the table. The meeting then adjourned.

The Annual Dinner

The meeting was closed by the annual dinner on Friday evenuing which was marked by some excellent speaking. Among the toasts were the Dominion and Provincial Governments, proposed by Mr. Lindsey and responded to by Hon. Frank Cochrane, Minister of Lands, Forests and Mines of Ontario; Hon. Ralph Smith, of British Columbia, and Hon. F. T. Congdon, of Yukon Territory. "The Mining Industry" was proposed by Dr. A. B. Willmott, of Sault Ste. Marie, and responded to by B. B. Lawrence, of New York, and Eugene Coste, of Toronto. "Our Guests," proposed by Col. A. M. Hay, of Toronto, was responded to by Dr. R. H. Richards, of Boston, and Dr. J. D. Irving, of New Haven. In answer to "Sister Societies," proposed by Dr. F. D. Adams, Dr. Ledoux, of New York, spoke for the American Institute of Mining Engineers, and Dean Galbraith, of Toronto, for the Canadian Society of Civil Engineers. "The Mining Press," proposed by Colonel Hay, brought responses from Frederick Hobart, of New York, and J. C. Murray, of Toronto.

The formal proceedings were closed by a brief valedictory speech by W. G. Miller, the retiring president, to which appropriate response was made by Dr. F. D. Adams, the new president.

Papers Received

The papers prepared for presentation at this meeting—other than those mentioned above—which were read by title or in brief abstract, were as follows:

"The Work and Functions of State Geological Surveys," by H. Foster Bain, San Francisco.

"The Origin of Archean Graphite," by H. P. H. Brumell, Buckingham, Quebec.

"An Automatic Pulp Divider," by Thomas Kiddie, Northport, Wash.

"Geology, Mining and Milling in the Thetford Asbestos District," by G. G. Gibbins, Montreal.

"Copper Mining on the British Columbia Coast," by W. M. Brewer, Victoria, B. C.

"Recent Developments at the Granby Smelter," by Frank E. Lathe, Grand Forks, B. C.

"Platinum Mining in the Tulameen District," by Charles Camsell, Ottawa.

"Some Antimony Ore Deposits in the Southern Yukon," by D. D. Cairnes, Ottawa.

"Sizing for Plate Amalgamation," by N. P. Nissen, Toronto.

"A Wet Sample Cutter," by H. E. T. Haultain, Toronto.

"The Geology of Petroleum," by Eugene Coste, Toronto.

"Coal Developments in Alberta," by James McEvoy, Toronto.

"The Spontaneous Combustion of Coal," by Edgar Stansfield, Montreal.

"The Alteration of Vegetable Matter into Coal," by D. B. Dowling, Ottawa.

"The Recording and Use of Colliery Data," by F. W. Gray, Glace Bay, N. S.

"The Hosmer Mines," by H. H. Yuill, Montreal.

"The Development of Ore Reduction in Cobalt," by Nicholas C. Groch, Cobalt.

"Setting Out Inclined Shaft Timbers," by D. J. Browne, Rossland, B. C.

"Fungus on Mine Timbers," by James Macoun, Ottawa.

"The Tenure of Mining Property," by Frederick Hobart, New York.

"The Unification of Mining Laws in Canada," by H. Mortimer-Lamb, Montreal.

"Some Notes on Recent Amendments to the Quebec Mining Act," by J. Obalski, Montreal.

"The United States Geological Survey," by R. H. Chapman, Ottawa.

"Methods of Making a Large Scale Contour Surface Plan of Mining Claims," by W. H. Boyd, Ottawa.

"The Portland Canal Region," by R. W. Thomson, Toronto.

"The Silver Fields of Nipissing," by Reginald E. Hore, Houghton, Mich.

"Nitro-Starch Dynamite, Its Manufacture and Use," by A. Mosco Vici, Montreal.

British Columbia Copper Company, Ltd.

The report of the British Columbia Copper Company, Ltd., for the year ended Nov. 30, 1909, states that production was interrupted for a period of three months from May to August on account of a strike of the coal miners of the Crows Nest Pass district from which the fuel supply is obtained. During the nine months' operation the mines at Greenwood, B. C., produced 367,024 tons of ore. This together with a small tonnage of custom ore amounted to 373,336 tons smelted. Blister copper to the amount of 6,366,318 lb. was recovered, containing fine copper 6,325,000 lb.; gold 18,244 oz., and silver 64,234 oz. The yield of copper per ton of ore was 17.7 lb. Gold and silver amounted to $1.03 per ton. The cost of producing, refining and marketing per pound of fine copper, after crediting expenditure with gold and silver contents, was 9.829c. The cost per ton of ore handled, including all charges from ore in place to sale of the contained metals, was $2.683.

In general the standard of operation was higher than in the previous year, as the expense and loss, due to the three months' cessation on account of coke shortage, were all borne by that portion of the year when operations were in progress. The loss entailed on account of the shutdown was approximately $30,000, besides an indirect loss for this period during which no profits were realized.

During the year the company acquired 132,556 shares of the common stock of the New Dominion Copper Company, Ltd., owning claims contiguous to the property of the British Columbia Copper Company. These shares represent over 53 per cent. of the capital stock of the New Dominion company. This will result in establishing relations between the two companies which should prove highly beneficial to both. This purchase was made also for the purpose of insuring a sufficient ore reserve to enable the company to operate under increased capacity, and to this end steps have already been taken to enlarge the capacity of the smeltery.

Esperanza, Ltd.

Esperanza, Ltd., owning the Mexican mine of that name, has issued a circular giving the principal figures of the annual report which will shortly follow. The estimated profit in the ore reserves of the mine is somewhat less than at the corresponding date of the previous year, but the profit from the tailings dump is about double what was calculated last year. It is further stated that the balance sheet will show cash and assets readily realizable, after providing for current liabilities and the final dividends for 1909 of over $800,000. Altogether the profit in the mine ore reserves and tailings dump and the cash total £723,293. The total costs of the company during the last quarter were $8.22 per ton of dry ore. The profit per ton ($8.81) in the ore reserves is about the same figure as last year, when it was $8.89 per ton.

Arizona Copper Company

The Arizona Copper Company, in the year ended Sept. 30, 1909, produced 741,068 tons of ore, which yielded 31,573,950 lb. of copper, or 42.49 lb. per ton of ore. In addition to the above ores there were mined and shipped 129,031 tons of limestone flux, making a grand total of ores and fluxes of 870,099 tons, as compared with 856,669 tons for the previous year. Of the total ores, 441,358 tons (59.57 per cent.) were derived from the Longfellow group, and the balance from the Metcalf and Coronado group, all in Graham county, Arizona.

The profit and loss account gives the operating costs at £616,541, and general charges £22,042. After paying preferential dividends to the amount of £24,531, and an ordinary dividend of 2s. 6d. per share, and transferring £80,000 to reserve account, a balance of £39,994 was carried forward.

The grade of ore treated was slightly lower than during the previous year. Fuel oil was substituted for coal at Clifton and Longfellow, the saving from which is estimated at $25,000 to $30,000 per year.

Quincy Mining Company

The 1909 output of the Quincy Mining Company, Hancock, Mich., was 22,511,984 lb. of copper, an increase of more than 9 per cent. over that of any other year. The cost per pound of copper was about ¾c. less than during 1908. A statement of operating costs follows, but no figures are given as to tonnage or grade of rock mined:

OPERATIONS IN 1909.

Sale of 22,511,984 lb. copper		$3,034,810
Mining expense	$1,765,965	
Opening mine expense	216,130	
Michigan taxes	58,749	
Smelting, transportation, etc	206,462	2,247,306
Mining profit		$787,504
Interest receipts	$9,631	
Real estate receipts	3,125	$12,756
		$800,260
Construction at mine	$68,137	
Construction at smeltery	8,434	
No. 9 shaft work	34,839	$111,410
Business profits		$688,850

Dividends amounting to $440,000 were paid and $120,000 was paid on the purchase of Franklin property, the company beginning the new year with a balance of $1,120,215 of liquid assets.

All the shafts except No. 6 have been sinking during the year and the reserves increased. The grade of the ore reserves is reported unchanged. Caving rock damaged No. 2 shaft to the 49th level, but it has been recovered to the 46th level. No. 4 shaft was permanently closed, and its output will be handled through No. 2. The sinking of No. 9 shaft was hampered by water, but this trouble was remedied and sinking is now proceeding rapidly. Considerable copper has been encountered in No. 9 and shipment may begin by spring.

Quincy officials are watching developments on the Hancock, and believe the lode recently reported from that property will traverse Quincy ground for more than 3½ miles and carry the underlay to great depth.

McKinley-Darragh

The annual statement of the McKinley-Darragh, at Cobalt, shows gross receipts in 1909 of $639,442, including balance of $46,419 from the previous year. From this were paid operating expenses and improvements, $294,262, and dividends aggregating $224,493, leaving a balance on hand of $120,759. Mine Manager Robbins' report shows that 1,297,530 oz. silver were produced in 1909, this being equal to the total production of the three preceding years. The ore reserves at the McKinley-Darragh are estimated at 4,975,000 oz., and at the Savage 755,000 ounces.

New Steel Works in Alabama

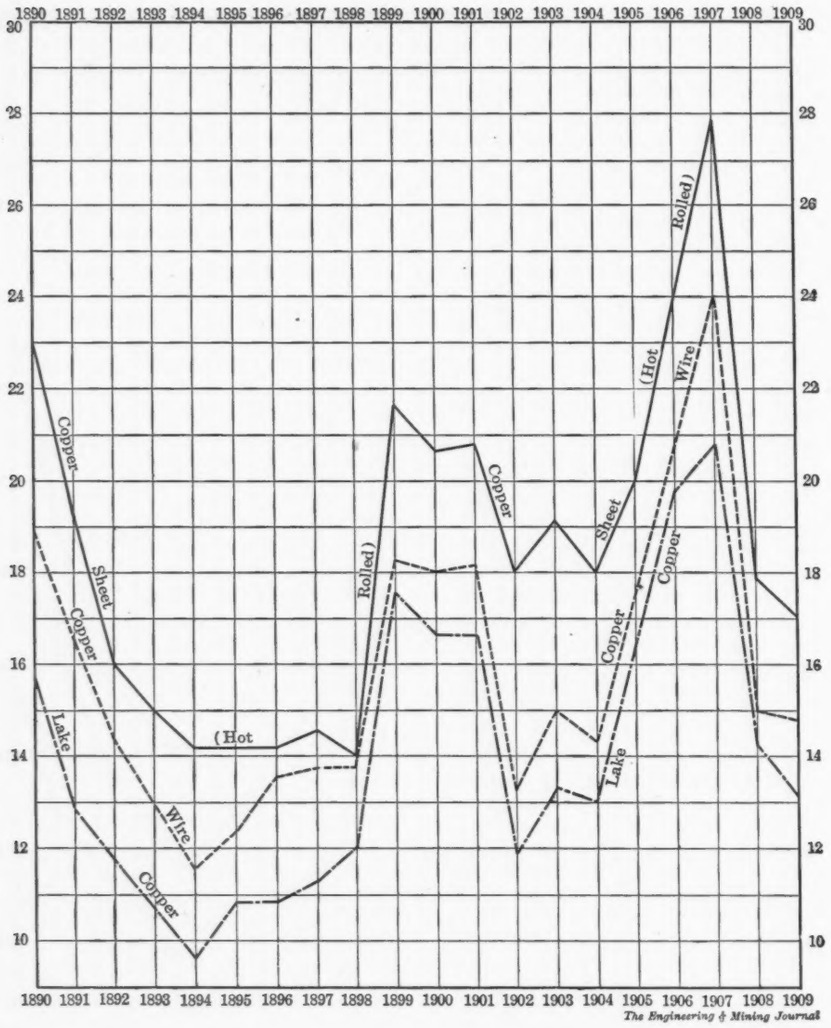
The sale of the properties of the Southern Steel Company, bankrupt, on April 12, 1909, to the Southern Iron and Steel Company, through a reorganization committee, was upheld in a decision handed down a few days since by the United States Circuit Court of Appeals in New Orleans. The court denied the petitions of George H. Schuler and Samuel I. Knight, to have the decree of the district court at Birmingham revised and dismissed their appeals. The reorganized company has charge of the properties, and has not only made needed repairs, but has built new mills near Gadsden, Ala., and will shortly put that industry in operation.

Ground has been broken for the extensive improvements of the Tennessee Coal, Iron and Railroad Company and the American Steel and Wire Company near Ensley, in the Birmingham district. A lake to provide more water, a power plant, by-product coke-oven plant and steel-wire and rod mills will be erected.

Diagram of Copper Prices

The accompanying diagram is interesting because of its graphic presentation of the relative price of bar copper and the chief primary manufactures, namely sheet and wire. In an editorial in the JOURNAL of Feb. 26, 1910, we discussed the conditions under which the price for these manufactures is established.

The lines in the accompanying diagram are plotted from the annual averages, the figures for Lake copper being as reported by the JOURNAL, while the figures for sheet and wire are as reported by the Department of Commerce and Labor up to 1908; for 1908 and 1909, as reported by the JOURNAL.



GRAPHIC COMPARISON OF THE PRICE OF COPPER AND ITS CHIEF MANUFACTURES

It would be preferable to make comparison with the price for electrolytic copper, but unfortunately data for that class of metal do not go further back than 1899, and consequently we have taken the figures for Lake copper in order to possess uniformity in the diagram, covering the period of 20 years. However, the line for electrolytic copper since 1898 would be substantially parallel to the line for Lake copper.

Errors in Testing Cyanide Solutions*

BY BEDE COLLINGRIDGE

The results of experiments have convinced me that potassium iodide influences the testing for "protective alkalinity" in cyanide solutions. Cyanide decomposes much faster in solutions which are deficient in protective alkalinity than it does when protected by an alkali; therefore, the method I give of testing without potassium iodide will mean a considerable saving of cyanide at large plants, as the method generally used is to test the cyanide and protective alkalinity in one measured portion.

Into 10 c.c. of the test solution, using potassium iodide as indicator, run standardized silver nitrate until a deep brown coloration of iodide of silver shows clearly, and note number of cubic centimeters of silver nitrate taken. Now, using another 10 c.c. of the test solution, without adding potassium iodide, run in twice the quantity of silver nitrate that was necessary in the above test, to make sure of getting rid of the alkalinity due to cyanide. Add phenol phthalein and titrate with standardized acid. The result will be protective alkalinity.

A second method gives clearer results than the foregoing, and also does away with the first part of the previous test. Into the measured portion of test solution, to which has been added the indicator, phenol phthalein, run in silver nitrate until the indicator color remains constant, then titrate with standardized acid in the ordinary way. With a little practice this gives good results.

The accompanying table shows the results of testing solutions by the first of these methods. The test solution was made slightly acid as regards protective alkalinity by adding 3.5 c.c. standard hydrochloric acid; 10 c.c. of the acidulated test solution were taken for each experiment and tested for protective alkalinity by the method given:

	Protective Alkalinity, Per Cent.	
I. Without adding KI...	nil	Clear end reaction.
II. With ½ cc. KI.....	0.002	Indistinct reaction.
III. With 1 cc. KI.....	0.0037	Indistinct reaction.
IV. With 5 cc. KI.....	0.0068	Indistinct reaction.

The results shown prove that solutions which contain no protective alkalinity give tests for protective alkalinity after the addition of potassium iodide, and that potassium iodide must be absent when testing cyanide solutions for protective alkalinity.

*Abstract of a paper presented before the Institution of Mining and Metallurgy, Jan. 20, 1910.

Rio Plata Mining Company

The second annual report of the Rio Plata Mining Company, Chihuahua, Mex., for the year ended Nov. 30, 1909, states that during the year, 14,580 tons of ore were mined averaging 63.8 oz. of silver per ton. The cost of mining is given at $1.89 per ton, this covering labor, timber, explosives, hoisting and tramming. A total of 1684 ft. of development work was done at a cost of $9.22 per foot.

Milling operations for April were hampered for lack of power and in May and June from lack of water for batteries and concentrators. The report states that the cost per ounce of silver recovered was 27.5c.; the total cost per ton of ore handled, $8.181. The recovery in the cyanide plant was 87.6 per cent. The revenue for the year from sale of ore and concentrates was, $192,030; rents, $2253; ore and concentrates on hand and in transit, Nov. 30, 1909, $20,622; total, $214,905. The total expenses were $117,139; profits, $97,766, carried to surplus account.

Dredging and the Sampling of Placer Ground

Preliminary Sampling Done by Test Pits, Followed by Systematic Drilling; Important New Fields in Siberia, Alaska and South America

BY A. P. ROGERS*

Dredge mining under the proper conditions presents one of the safest and most attractive forms of investment that exist today, but so many placer claims prove to be valueless after an examination has been made that a brief description of the methods pursued by engineers in testing them should benefit the general public. A properly conducted examination will determine the possible return upon the investment as closely as anything can be figured, and it is to the interest of the land owner to be more or less sure of his ground before he becomes too enthusiastic about it.

Important Dredging Fields

The most extensive operations in dredge mining today are those in California, where an immense amount of capital is invested in huge dredges, some of which handle over 250,000 cu.yd. of gravel per month at a cost of 2 or 3c. per yard. The Natomas Company, in California, not only saves the gold but crushes much of the gravel for road material, and is now replanting the areas over which it has dredged, with fruit trees. This is, perhaps, the highest development of the industry so far attempted, but it has long been known just how that land would dredge and the results possible were much simpler to determine than in a new, untried region, although they had to be worked out in the beginning with the crude New Zealand dredge.

Another large field is in the Klondike region of Alaska, where the Yukon Gold Company has been at work for several years in solving the problem of successfully dredging frozen gravel. The gold contents are higher than in California, but the latitude of the country and the short season during which work can be prosecuted, combine to make the costs of operation also higher. Conditions, altogether different from those in California, have been met and overcome, although it has required the best engineering skill and much money to succeed.

Another field, which presents still a different class of obstacles, is just opening up at present in the tropics of South America and in the Philippines. In these countries it is possible to work all through the year unless torrential rains cause a temporary shutdown. The effect of malarial fevers and uncertain political conditions in these countries is still to be considered. There is much clay in some of the deposits, and an impenetrable jungle which must be cleared away covers most of them.

Perhaps the latest important field under observation is one in the Southern States, which is being tested to determine whether the gold can be extracted from a deposit containing a large percentage of sticky clay. The ordinary dredge will not produce results in this region, and it remains to be seen whether something can be devised to handle the material on a large scale. Dredging is still being carried on in several of our Western States; in New Zealand; and in sections of Siberia where the results, so far obtained, have been most encouraging; in fact, some remarkably rich deposits have been found in the latter country.

From this brief mention of the important fields, it will be realized how scattered are the deposits. Americans would prefer to operate in their own country, but the requisite natural conditions are difficult to find, and practically all of the larger deposits have been taken up. Those remaining are either small in area, low in grade, or present some other obstacle which must be overcome to prove successful.

Preliminary Sampling of Placer Ground

No dredge will do good work if left to itself. It is a complicated mass of machinery which must be carefully handled by experts in this particular line of work to obtain the results estimated by the engineer. It must be adapted to the particular conditions existing at each locality. It is the business of the engineer to determine exactly what these conditions are, and decide whether they are suitable for a dredge, as well as the amount of gold the gravel contains per yard. To obtain this information he lays out a course of action which will insure a minimum of expenses until he is satisfied the showing justifies a further outlay. In other words, he looks carefully in advance before each step is taken, and is in a position to stop at any time he finds an insurmountable obstacle before any large sum of money has been expended. If more people would recognize this form of insurance there would be fewer idle dredges lying about as expensive monuments to some disastrous failure.

To illustrate this advice by a concrete example, I will mention the methods pursued by the engineers in examining a piece of dredging land in South America a year or so ago. Gold has been known to exist in that region for centuries, and many attempts have been made by foreign companies to work the deposits with small dredges. Every one of these attempts proved a failure for one reason or another, and at the time of this examination practically all the dredges were out of commission. The engineer, however, noted upon his preliminary survey that the gravel contained much gold; in fact, the old Spanish workings were proof of this. The property was well situated upon a navigable river, and the physical conditions were ideal. He thereupon determined to obtain some samples by sinking pits to water level at stated intervals.

This is a rough method of sampling a property, but if it is well done by an experienced man, it is surprising to note how accurate the results may be. The pits must be sunk at points which will afford a fair average of the ground and have their sides as perpendicular as possible. Then, by scraping down one side of the pit with a pick for 18 in. from the surface, enough dirt or gravel is taken to fill three pans. These are carefully washed out and the gold so recovered is put away in a small bottle to be weighed later. The next 18 in. in depth is sampled in a similar way; and so on, down to water level. By assuming that 135 pans of gravel equal 1 cu.yd. in place, the value per yard for each 18-in. section can be readily calculated, as well as the average value for the whole pit. Of course, nothing can be told about the ground below permanent water level, but for preliminary purposes this method of sampling requires a minimum of equipment and it affords the man who does the work an excellent chance to see the character of the gravel. Where the water level comes directly to the surface, it cannot be used, and a hand drill should be employed, but it is seldom that such conditions exist all over a property.

As each pit is sampled the results are noted upon a plan of the property, and finally a general average for the whole plot can be estimated for the depth sampled. A small hand compass and a steel tape are the only instruments needed to make a rough plan of the property and indicate the relative positions and elevation of the pits.

With these data in his pocket, and all the information he could obtain regarding the history and physical conditions of

*Mining engineer, 25 Broad street, New York.

the property, the engineer returned and submitted it to his principals. They decided at once to undertake a detailed examination for the purchase and equipment of the property.

Details of Sampling

This time the engineer took with him a churn drill and crew to thoroughly sample the ground. He had the benefit of his preliminary work to guide him in his operations and was able to plan his mode of attack with the least possible loss of time. While the crew was putting the drill together, the engineer with one or two assistants, proceeded to "flag" the ground. By this I mean that the area to be drilled was marked off into squares of equal size, and sticks with small pieces of cloth nailed to them were set up at the alternate corners of each square to mark the places where the drill holes were to be sunk. The size of the squares depends upon the nature of the deposit, and the engineer uses his good judgment in deciding what they shall be. Usually they are 200 to 400 ft. on each side.

When this work had been far enough advanced, a surveying party was sent out to make an accurate map of the property, showing the elevation and position of each hole or test pit. At the same time, the drill was brought to the first flag and started to work. Usually the first few holes that are put down will give an idea of the real value of the deposit, and if they are not encouraging, the drill should be skipped around from flag to flag until a channel can be located. For an ideal dredging property, the gold should be pretty evenly distributed through the gravel from the surface down to bedrock, and be bright enough to amalgamate easily.

The conditions found upon this particular property were excellent: The gravel was all small, with no stones larger than a man's head; there was a little clay mixed through the gravel but it contained so much sand that it would cause no trouble; the overburden of soil was not heavy; and the bedrock was a clay containing no gold. In addition to this, no blank holes were sunk, showing that the distribution of the gold was quite regular.

The data on each hole drilled were kept in detail, and after the work was finished, the general average value and yardage for the dredgeable area was figured out. Having obtained this information accurately, the engineer had something tangible to figure on, and could then determine what the working costs should be. While this ground has not yet been equipped, it soon will be, and the examination was so carefully and thoroughly done, there is no question that it will dredge as estimated and show good results.

Another case, which has proven that correct estimates can be made, may be mentioned here as an illustration of some accurate work. This was at a placer property in one of the Western States, upon which a dredge was already working, but upon a poor part of the deposit. The ground had not been properly drilled in the beginning, and the anticipated profits were not obtained. It was decided to drill ahead to see if something better could be found. A hand drill was employed for this purpose, and after the work was finished, the dredge was moved over to this new ground. The results have checked up almost exactly with the sampling done, and have proved a great benefit in directing the future operations upon the property.

Placer Deposits Containing Clay

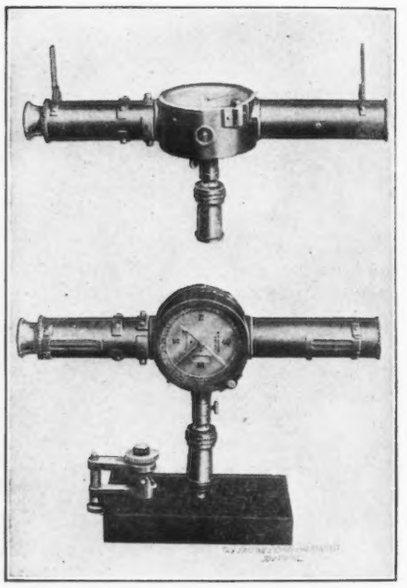
Perhaps one of the most interesting properties now being tested to determine its commercial value, is one in North Carolina, which I have already referred to. This region has been regarded generally as a doubtful gold country for several reasons, although the presence of gold has long been known and a large amount has been recovered by individual workers. All attempts to work these deposits successfully upon a large scale, however, have been failures because the promoters did not correctly understand the conditions, or because of the low-grade gravel. The nature of the deposit is most unusual; in fact, it is unique in that it is not a placer deposit in the generally accepted definition of the term. Here we find a micaceous schist, through which a system of small quartz stringers carrying free gold run in every direction, forming a veritable network of little veins, called a stockwork deposit. The peculiar characteristic of the field, however, is the fact that the schists have decayed and rotted away into a kind of clay, breaking up the veins and setting the gold free. This large amount of clay prevents the use of any ordinary methods for its recovery, and it is only within the last year that a machine has been devised and perfected to handle it successfully. This machine, called a separator, has been described by other writers and I need only say that it breaks up the lumps of clay, which washes away, while the gold remains behind, due to its greater specific gravity. To definitely determine this point has required a long series of experiments and a careful sampling of the ground, before making any outlay upon a dredge. The results obtainable have been so satisfactory that the property is to be equipped with a large dredge, using these separators in place of riffles. Some of this ground runs over 50c. per cubic yard.

These illustrations are mentioned as examples of dredging operations which have been brought to a successful issue, or give promise of so doing. Every piece of placer ground, however, is not necessarily suitable for dredging purposes. At each one the conditions vary in some particular, and it becomes a question of solving these conditions successfully and at a profit which will warrant the investment.

A Stadia Hand Transit

A stadia hand transit is being made by Keuffel & Esser Company which increases the adaptability of hand instruments in surveying. In measuring vertical angles, the sighted object and the two scale readings (slopes and degrees) appear together in the field of view. Compass bearings can be sighted by the telescope on level ground, or by the folding sights on sloping ground.

The instrument is threaded to be mounted with the compass box horizontal for using the compass, or vertical for using the clinometer. The leveling attachment is adjusted by slow-motion screw and considerably increases the accuracy, especially when sighting at long range.



Stadia Hand Transit

In combination with a flexible leveling rod, this transit is convenient for many kinds of surveying work and will give greater accuracy than is usually expected from a hand transit.

The flexible leveling rods are strips of prepared canvas, 3 in. wide, graduated like self-reading rods. For use they are fastened to a straight board with thumb tacks, and when rolled up are easily carried in the pocket.

The telescope is 10 in. long, and provided with a 1-in. object glass with cross hairs and stadia hairs adjusted to read 1:100. Vertical angles can be measured to single degrees.

Recent Patents for Basic-lined Copper Converters

A Review of the Peirce and Smith Converter Patents; These Basic-lined Converters Being Used at Garfield, Baltimore and Perth Amboy

BY RICHARD H. VAIL

The experiments which have been in progress at the Garfield plant of the American Smelting and Refining Company for a number of months with basic-lined converters, designed by William H. Peirce and Elias A. C. Smith, of Baltimore, will make of interest a review of the various constructions which they have recently patented. The converters as used in practice are of unusual length, being about 20 ft. long by 10 ft. in diameter. They are lined with magnesia brick, silica for fluxing the iron being added in the form of ore which is fed from "boats." The use of basic lining is not novel in copper converting and offers no metallurgical difficulties. They are indeed in some respects easier to operate than acid-lined converters.

Physical Difficulties

The difficulty in the operation of the basic-lined converter has from the first been in getting the lining to withstand the physical strains, and the patents taken out by Messrs. Pierce and Smith have with one or two exceptions been entirely along this line. Their efforts represent a number of ingenious improvements and have demonstrated the possibility of the commercial use of basic-lined copper converters, a concomitant of which will probably be the treatment in many plants of lower-grade mattes than can now be profitably handled in acid-lined converters.

At Baltimore at the plant of the Baltimore Copper Smelting and Rolling Company, where the practical features of these converters were worked out, the basic-lined converter has been operated for about two years. Three basic-lined converters have been built at Garfield, Utah, and one has been in operation for about nine months at the Perth Amboy plant of the American Smelting and Refining Company, where copper and lead-copper mattes have been successfully converted, connection being made with the baghouse when the lead-copper matte is treated.

The First Patent

The first important patent by Messrs. Peirce and Smith was applied[1] for June 13, 1908. This application is liberally quoted from herewith as the inventors have given therein a general review of their aims.

Owing to the large percentage of iron always present in the matte, as a cheap source of fuel supply to insure requisite fluidity, the corrosion of acid converter lining goes on apace, and the whole of the free silica is quickly taken up so that the renewal of the lining becomes necessary, at much delay and expense, after only a few hours' run. To avoid such frequent renewals of the acid lining, it has been proposed to employ instead, a basic lining, this generally being composed of magnesia brick.

The silicious flux for union with the iron oxide to form the slag is no longer derived from the lining, but is introduced into the converter in the form of loose pulverulent ore supplied at suitable intervals.

[1] U. S. Pat. No. 942,346; Dec. 7, 1909.

Experience, however, soon showed that the converter with ordinary basic lining was nearly as short lived as the earlier form equipped with the corrodible acid lining. The tuyeres for the air blast were composed of perforated magnesia brick. As is well known, the entering blast chills the charge in proximity to the air vent, so that a "cold nose" quickly forms and becomes adherent to the tip of the tuyere. Constant vigilance on the part of the workmen becomes requisite to dislodge the nose by thrusting the punching tool through the air channel of the tuyere. This "cold nose" was especially adherent to tuyeres of magnesia brick, and pieces of the brick were frequently broken off in removing the chilled material. In a comparatively short time the bricks become so thin as to require renewal, or to impair the fidelity of the construction immediately above.

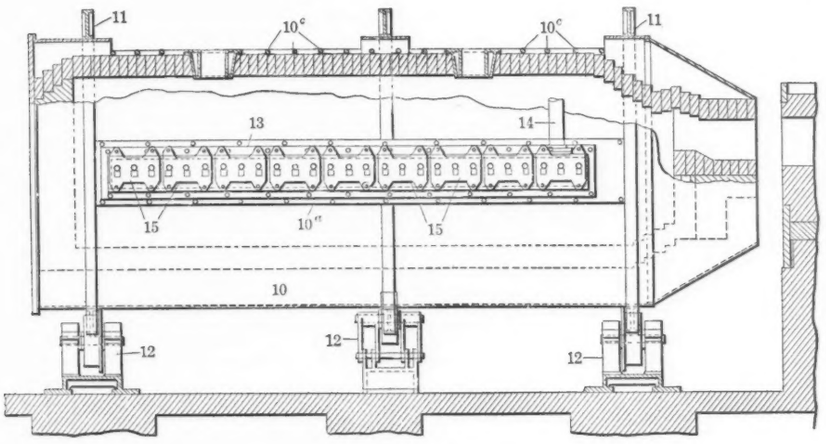


FIG. 1. SIDE SECTIONAL ELEVATION OF PEIRCE AND SMITH BASIC-LINED CONVERTER

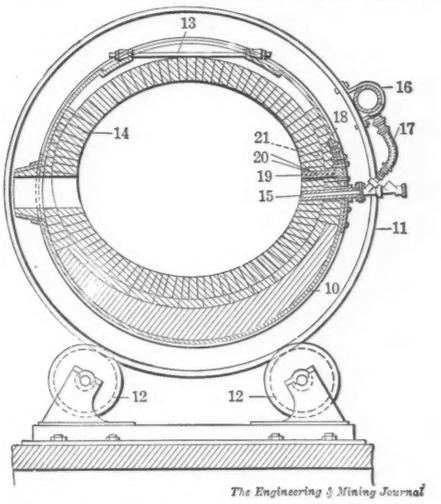


FIG. 2. LATER ARRANGEMENT OF INDIVIDUAL TUYERE PIPES

Expansible Lining

The invention further designs to provide an inner non-corrodible lining free to shift under varying heat conditions. The plan was to equip the converter with a non-corrodible lining of tenacious coherent texture, left free to expand or shift under heat, without risk of buckling or rupture, said lining to be united with a set of tuyeres flexibly sustained so as to participate in the play of the lining up and down, the lining thus being maintained in floating fashion, as it were.

As shown in Figs. 1 and 2, the upper side of the converter shell is left open, while a series of tie rods, 10*c*., extends across the opening to keep the shell from

spreading, which otherwise might easily occur, once the inner lining expands or swells far enough under the influence of extreme heat.

Cast Iron Tuyeres

It was planned to form the flexible tuyere of cast iron, entending entirely through the lining, but properly jointed at the back to the air conduit in tight fashion to prevent all vagrant leaks of the blast, such as in prior usage tended constantly to undermine the coherent lining. Formed of metal, the improved tuyere stoutly withstands the blow of the punching tool, while, as experience shows, the "cold nose" that forms constantly at the tuyere tip is much less adherent than in the case of the earlier magnesia tuyere; hence the nose is detached readily when attacked by the workmen.

In the original application, each tuyere was to consist of a hollow iron casting, made square in cross-section, to snugly adapt itself to the faces of the lining brick. Referring to Fig. 3, the tuyere 16 extended entirely through the lining for certain delivery of the air at the very tip.

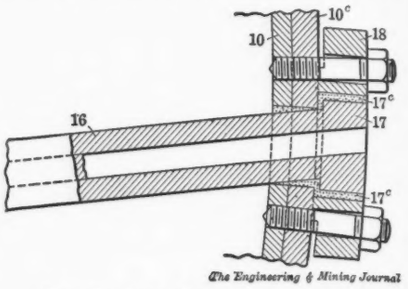


Fig. 3. The Cast-iron Tuyere

In position the tuyere was set at a slight incline and furnished with an enlarged head 17 that rests snugly within a square hole of the retainer plate 18, arranged to receive three adjacent tuyeres. About the neck and head of each tuyere is placed packing 17 *a*, originally of asbestos wicking (metallic lead is now used as packing), sufficient in quantity to stop the leakage of air next the shell and serving besides to sustain the tuyeres by a flexible air-tight joint during the rise and fall of the tuyere at its free end, due to the "heave" of the lining, as the latter contracts or expands under the changes of temperature occurring within the converter. The old type of windbox has been replaced in actual practice by a bustle pipe from which the air is supplied to each individual tuyere by rubber hose. The tuyere valves are of the Dyblie ball type.

The original specifications suggest that the vessel's interior be lined with magnesia brick of the usual sort but instead of lining the layer of brick and tuyeres with the usual cement of ground magnesite with a slight addition of clay to cause the cement to adhere, it is suggested to employ for the purpose a cement composed of ground magnesite and linseed oil. Experience showed that the cement thus prepared bakes hard and clings to the brick and tuyeres, completely closing all cracks and passages (otherwise apt to develop) and remaining tenacious and adherent at all extremes of temperature within the vessel.

Arrangement of Tuyeres and Converter Mouth

Another patent[2] taken out by Mr. Smith relates to the arrangement of the converter tuyeres, regardless of whether the operation is carried on in a converter having an acid or a non-corrodible lining. The characteristic feature of this invention consists in so arranging the tuyeres that the outlet port will be substantially out of range of the ejecting or "slopping" action of the tuyeres. This will be readily understood by reference to Fig. 4 in which the outlet port or mouth of the converter is shown substantially at the end thereof; the outlet port, however, may be at any other position. The converters in use at Garfield, Utah, and at Perth Amboy have the mouth in the position shown in the illustration.

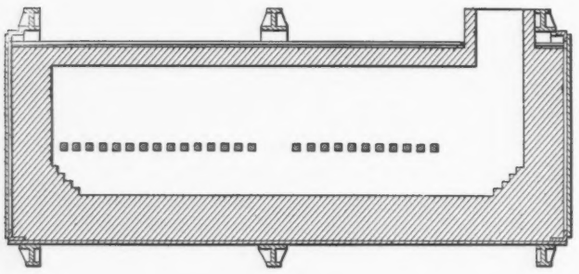


Fig. 4. Smith Patent with Converter Mouth at End

Abutment to Anchor Lining

To prevent the distortion or breaking of tuyeres by the shifting of the lining, Mr. Peirce in October, 1909, filed application for a new patent[3] in which the lining is shiftable, relatively to the shell, as before, but that section of the lining in the immediate neighborhood of the tuyeres is anchored to the shell to form a zone in which there is no substantial shift. The lining is made stationary at the tuyere belt by means of the metal abutments, secured to the shell and extending into the lining adjacent to the tuyeres. The abutment comprises a series of cast-metal brackets preferably arranged above and spaced apart from the tuyeres as shown in Fig. 5; the brackets thus form a barrier against substantial transverse shift of the lining in the immediate neighborhood of the tuyeres so that the latter cannot be bent or broken by the movement of the lining. The lining is otherwise free to expand under the influence of the heat of the operation, and may shift in opposite direction from the tuyere belt and thus preserve its continuity.

The brackets are preferably water cooled, in which case the application states that it is preferable to place them far enough above the tuyeres to prevent the submersion of the brackets when the converter is in operation, thus avoiding the danger of explosion in case the water-cooled brackets should leak. In the form shown the inwardly projecting portion or shelf 19 of each bracket is provided with water pipes 20, extending longitudinally therethrough. Each bracket has strengthening ribs 21 that extend between the upper side of the shelf 19 and the base portion 18, the ribs being spaced in accordance with the size of the lining bricks employed. Another form of bracket is also suggested in which the water-cooled bracket surrounds the tuyeres, and is riveted at the base to the converter shell.

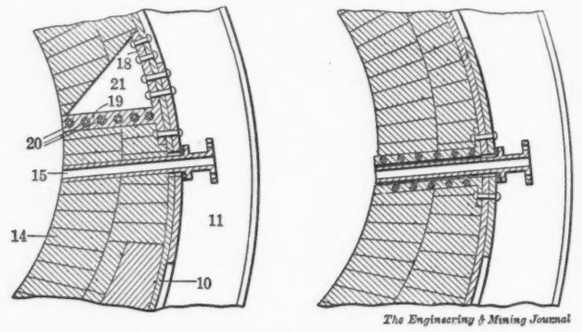


Fig. 5. Brackets to Keep Lining Stationary

Shell with Telescopic Head

In his latest patent[4] Mr. Peirce provides for a cylindrical shell with flanged head which telescopically engages the end of the converter shell, and with adjustable connections between the head and shell. As shown in Figs. 6 and 7, the cramp bars extend across the outer face of the head and are connected to the shell by a tie-bolt. As the lining expands, the tie-bolts are slackened off so that the head may be forced outwardly to relieve the strain. The tie-bolts are preferably provided with

[2]U. S. Pat. No. 942,675, Dec. 7, 1909; reissue, No. 13,080, Jan. 25, 1910.

[3]U. S. Pat. No. 942,661, Dec. 7, 1909.

[4]U. S. Pat. No. 944,905, Dec. 28, 1909.

yielding washers or equivalent devices. Fig. 6 is a view partly in side elevation and partly in longitudinal section of such a converter. Fig. 7 is an enlarged detailed section of the expansible head through the line 4-4.

All of the patents here described are not embodied in the construction of the converters as used at Garfield. Their principal points, however, are shown in Figs. 2, 4, 6 and 7. There have been no especial metallurgical difficulties, but certain mechanical changes have been made as occasions manifested themselves in the actual operation. In the course of nine months' operations the converters have demonstrated that a much larger tonnage can be handled with a decided reduction for lining expense. Mattes of lower grade can also be profitably made with the incidental smelting of larger quantities of silicious ore.

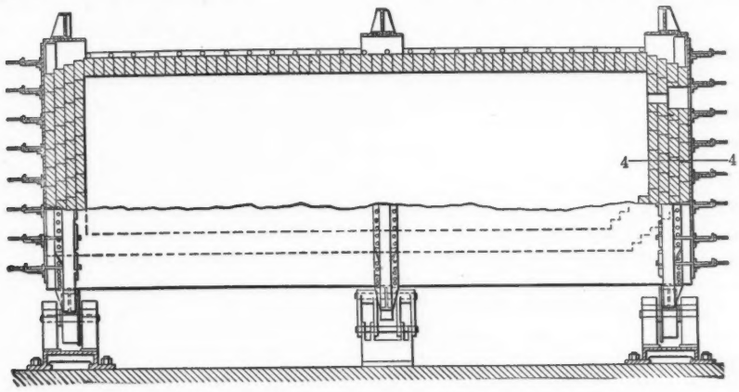


FIG. 6. SIDE SECTIONAL ELEVATION OF CONVERTER WITH TELESCOPIC ENDS

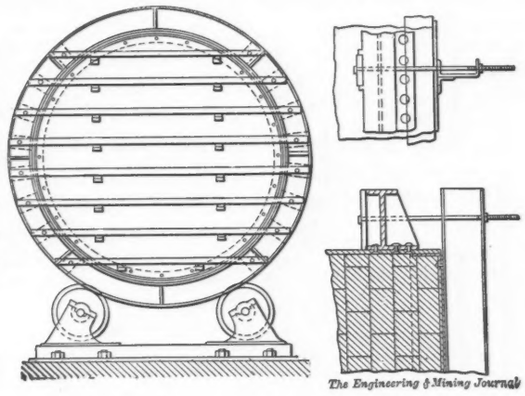


FIG. 7. SECTION OF HEAD AND DETAILS OF CRAMP BARS

The linings are laid with 9-in. magnesia bricks, several courses being used at the lower portion of the shell. Around the tuyeres, however, 18-in. brick is used. The principal wear is along and just above the tuyere zone. The tuyeres and brick adjacent require replacing after production of from 2,500,000 to 4,000,000 lb. of copper. The average lining is expected to give a production of 1000 tons of copper from 35 to 40 per cent. matte. The slags are kept somewhat lower in silica than when acid-lined converters are used. The charges are usually started with about 40 tons of matte, which is added to at intervals until about 100 tons have been put in, the charge then being blown to blister copper. It is expected that a detailed account of the operation of these converters will soon be available for publication.

The second gram of radium has just been produced at Joachimsthal, Bohemia, and word has been sent to the Austrian sales bureau that it is now available for shipment. By every gram of radium produced the Austrian exchequer benefits, as its value is fixed for valuation purposes at $2,375,000 an ounce, and the demand far exceeds the supply.

Dolcoath Mine, Ltd.

The report of the Dolcoath Mine, Ltd. of Cornwall, for the last six months of 1909 records a profit of £12,722 as against £14,827 for the previous six months. The grade of ore worked has fallen from a recovery of 48.85 to 43.68 lb. of black tin per ton of ore. The increased market price of tin has allowed lower grade of ore to be worked at a profit. The working costs were 25.7s. exclusive of the lord's royalty of 2.2s; the company's profits were in round figures 5.5s. per ton. The new vertical shaft, which will, it is hoped, produce more economical work, is not yet in commission. The present depth is 2832 ft. and further sinking will be continued to 3000 ft. The manager's report gives particulars of the grade of ore met with at those parts of the mine where development is in progress, but from the way the information is presented, it is not easy to say whether, on the whole, the condition of the mine is as satisfactory as it was at the date of the last report. The impression given is that the bottom developments are not so favorable as they were, owing to the occurrence of a "sparry" course which is unproductive in tin. A longitudinal section with the ore reserves plainly marked would make the situation more intelligible. What one would like to know is the tonnage developed and its value, and what the prospects are as regards a reduction in working costs when the new shaft is in working order.

Lackawanna Steel Company

This company owns blast furnaces and a steel plant near Buffalo, N. Y.; iron-ore mines in the Lake Superior region, and other subsidiary enterprises. The report for the year 1909 shows $34,750,000 stock; $23,517,000 bonds, and $15,000,000 notes outstanding. The cost of property and plants is given at $63,105,916; while the sum of $6,191,379 is given as the value of investments in iron-mining and other subsidiary companies.

The income account for the year is as follows:

Gross sales and earnings	$25,296,661
Interest on investment	451,430
Total receipts	$25,748,091
Operating expenses	$20,586,839
General expenses and taxes	692,877
Total expenses	$21,279,716
Net earnings	$ 4,468,375
Interest, rentals, etc.	3,690,266
Surplus for the year	$ 778,109

Gross sales and earnings increased $10,208,779 over 1908, but were $7,714,749 less than in 1907.

Oil Developments in West Virginia

Among new companies drilling for oil in the West Virginia field are the Regal company at Parkersburg, the White Rock Oil Company at Lewisburg and the Porter Oil and Gas Company in Brooke county. In Marion county, the Burt Oil Company's second well, on the J. R. Baker farm in the Mannington district, began to spout 40 bbl. per hour; it is 1200 ft. south of the Wells well which started with 75 bbl. per hour last year and is now yielding 450 bbl. per day.

In Harrison county, Miller & Co.'s new gusher on the Nimshi-Mizum farm is now producing 450 bbl.; the South Penn wells Nos. 1 and 2 on the Whiteman farms are giving 1050 and 1260 bbl. respectively; while No. 1 well of the Philadelphia company, on the Swiger land, is flowing 750 bbl. per day.

In Roane county, Lovering & Wooster have just brought in a 25-bbl. producer from the Big Injun sand on the Hascue farm in Walton district. In Lincoln county, the Interstate Gas Company has struck a gasser of 1,000,000 cu.ft. daily yield, on the Cook-Evans farm in Sheridan district. In the Duval region, the South Penn Company in its No. 11 on Horse Creek, and the Ohio Fuel and Oil Company, on the Morrison farm, have both drilled through the Berea grit for small oil wells below, while a gasser has been struck by the Hamlin Oil Company.

Cyanide Practice at Minas del Tajo, Sinaloa

Crushing in Solution; Separate Sand and Slime Treatment, Oliver Continuous Filters Being Used for the Latter; Treatment Costs $1.37 per Ton

BY G. A. TWEEDY AND R. L. BEALS*

The old pan-amalgamation process, in operation at the Minas del Tajo up to and including 1905, while paying a profit on high-grade ores, was no longer able to treat profitably the ores in sight at that time; hence an alteration in the process was imperative. Crushing with stamps and subsequent treatment by cyanidation was finally decided upon. The success of this alteration is eloquently expressed in the comparative cost data in Table 1.

TABLE 1. COMPARATIVE COST BY CYANIDATION AND PAN AMALGAMATION.

	Pan Amalgamation.	Cyanidation. 1907.	1908.
Tons treated.....	51,387	58,983	69,200
Value per ton.....	$10.78	$8.39	$8.28
Extraction, per cent..	65.00	88.56	87.45
Extraction, per ton..	$7.00	$7.43	$7.24
Total cost, per ton treated.....	6.50	4.36	4.01
Profit, per ton treated	0.50	3.07	3.23

Character of Ore

Two classes of ore are mined and treated—namely, oxidized and unoxidized ore. Roughly speaking, all ore coming from below the 150-ft. level falls into the latter class.

Unoxidized Ore. Type 1, characterized by large proportion of galena, not rich in silver, and presenting no difficulty in treatment. Type 2, carrying a lesser proportion of galena, accompanied, however, with blende and chalcopyrite. Whenever this chalcopyrite is found the ratio of gold to silver increases. This type of ore is amenable to treatment, but causes a larger cyanide consumption. Type 3, clean ore, carrying little base sulphides, with a greater ratio of silver to gold, and easily cyanided. The gangue of this type contains a considerable amount of rhodochrosite and feldspar.

Oxidized Ore. The counterparts of these types in the oxidized ore are traced by their silver-gold content ratio, and by the presence of analogous minerals derived from the oxidation of the base sulphides, etc. For instance, Type 1 shows considerable lead carbonate; Type 2, a lesser amount of lead carbonate, accompanied by zinc carbonate and copper carbonates and oxides, while Type 3 contains manganese oxides, particularly psilomelane or wad.

All these types are amenable to cyanide treatment, Type 2 causing the greatest cyanide consumption, while Type 3 produces the most slime, due to the greater proportion of clay.

A typical analysis of Type 3, oxidized ore, is: Copper, 0.2 per cent.; iron, 4.2; zinc, 1.4; manganese, 1.6; lead, trace; lime (CaO), 1.2; sulphur, 1.5; insoluble (Al_2O_3 and SiO_2), 82.8; undetermined, 7.1; gold, 0.20 oz. per ton; silver, 8.60. The sulphur is partly combined as sulphide and partly as the sulphates, $FeSO_4$ and $Fe_2(SO_4)_3$, the acid sulphate accounting for the greater acidity of this class of ore. The undetermined comprises CO_2, oxygen of the sulphates, and oxygen combined with manganese, etc.

Preliminary Experiments

Before the erection of the stamp mill and cyanide plant, experiments were conducted to determine the best method of treatment. The ore experimented upon was the unoxidized class. Samples were taken from various parts of the mine and treated separately in 100-lb. lots.

The feasibility of collection of sand, leachability, and extraction on a working scale were determined by small mill runs, the ore being crushed in 5- and 10-ton lots in a five-stamp battery; the pulp was run to a pit, where the sand was collected, the slime overflowing through a gate and settling in a tank below the pit, the overflow being regulated by raising the gate. The net result of these leaching tests showed:

(1) That the extraction of gold was 97 per cent. and silver 89.6 per cent.

(2) That the dissolution of the gold was rapid, the silver going into solution more slowly.

(3) That the best results were obtained by allowing the charges to drain thoroughly before each addition of solution.

(4) That the leaching rate was 4 to 6 in. per hour, and that no serious fouling of working solution took place.

(5) That the cyanide consumption was 2.2 lb. per ton of sand.

The collected slime from the test runs was treated, in small tanks fitted with mechanical stirrers, by agitation and decantation in solution averaging 0.20 per cent. of KCN. The extraction was: gold, 94, and silver, 88 per cent. The consistency of the pulp giving the best results was 4 of solution and 1 of dry slime. The slime settled to 52 per cent. of moisture in 12 hours.

To determine the advisability of concentration of the ore, a sample of the sand in each charge was concentrated before and after treatment with cyanide. A slightly increased extraction could be made by separating and regrinding, but this increased extraction was not sufficient to justfy the erection of an extra plant.

Outline of Operations

The ore from the mine is crushed by a No. 5 Gates breaker, style K, to pass a 2-in. ring. The breaker is fed from two 200-ton bins, and the ore, after crushing, is elevated by inclined belt to the fine-ore bins. The mill and cyanide plant are situated on the Rosario river, half a mile from the mine, the ore being hauled to the mill by a light locomotive in gable-bottom cars, holding 15 tons. The bins at the mill have a capacity of 600 tons. The ore is fed from the mill bins by automatic feeders to 12 batteries of 5 stamps each, crushing in cyanide solution. Lime is added to the ore in the bin as needed. The alkalinity of the battery solution is maintained at 0.05 per cent. of CaO. From the batteries the pulp flows directly to four sand-collecting tanks, each holding 145 tons of dry sand. The pulp is distributed by radial-arm distributors, fitted with ball bearings, each tank being equipped with a distributor. The sand settles, and the slime overflows through four curtained gates to a launder leading to the slime plant.

The two slime-collecting tanks are 35 ft. in diameter by 9.5 ft. deep, set in series, so that the pulp enters one and overflows to the second. The overflow from the second tank runs to a concrete sump, and is then pumped back to the battery-supply tank above the mill.

The sand, after collection and thorough draining, is transferred by cars to the leaching tanks, 14 in number. After treatment the sand is sluiced to the river.

The thickened slime is withdrawn at regular intervals from the slime-collecting tanks. The treatment of this slime, by agitation and settlement, takes place in nine tanks, each 24 ft. in diameter by 9.5 ft. deep. From the treatment tanks the slime is transferred to a tank of the same size, supplying the filters.

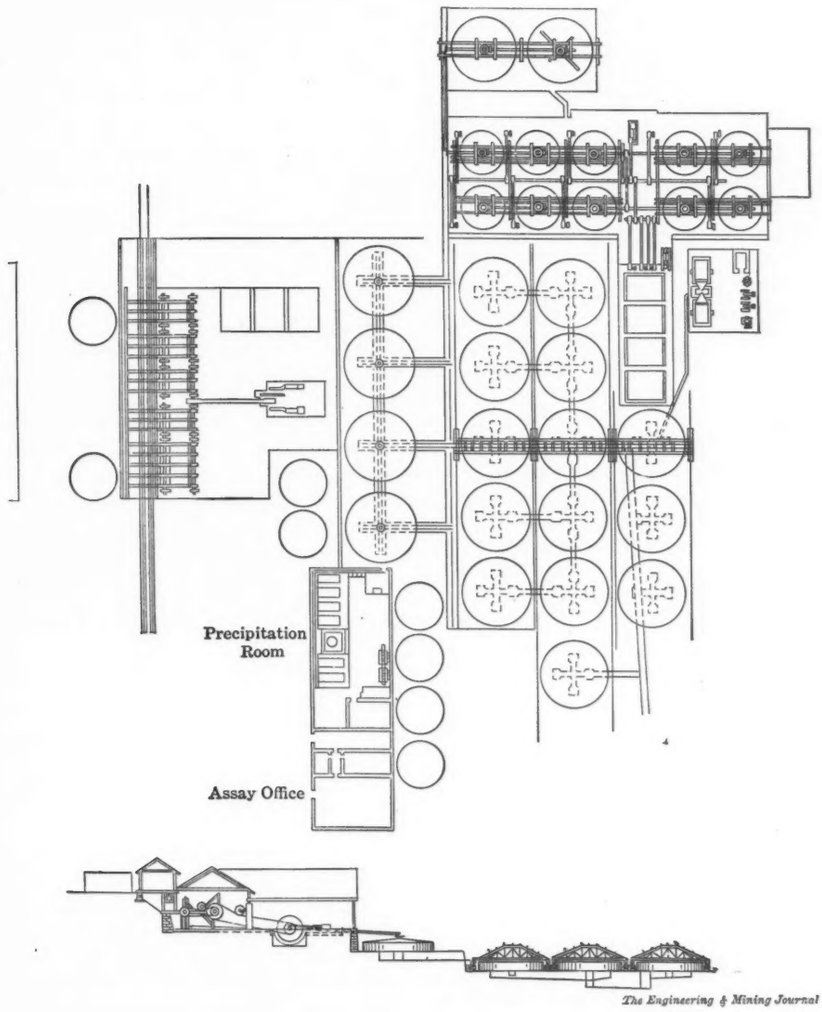
The solutions from the sand and slime plant are collected in sumps, built of brick and faced with cement. Centrifugal pumps, driven by the engine running the slime plant, handle the solutions. The water for the mill and mine is supplied by steam pumps situated in a well connected by a tunnel with the river.

*Rosario, Sinaloa, Mex.

NOTE—Excerpt from a paper, "Cyanide Plant and Practice at the Minas del Tajo, Rosario, Sinaloa, Mexico." *Bull.* 38, A. I. M. E., Feb., 1910.

Stamp Milling

The mill consists of 12 batteries of 5 stamps set on concrete mortar blocks. The battery frame is of the front-knee pattern, the sills anchored in concrete by 1.5-in. bolts. Each mortar weighs 5 tons. Though designed for double discharge, they now have the backs blocked up with a heavy cast-iron plate and are fitted with liners. The mortars were planed on their bases, and the tops of the concrete blocks were finished carefully with neat cement.



Plan and Sectional Elevation of Mill and Cyanide Plant

Between mortar and block a ⅛-in. sheet of rubber is placed; eight bolts, 1.5 in. in diameter, are used to hold the mortar rigidly in place on the block.

The gross weight of the stamp with new shoe is: stem, 450; boss, 350; tappet, 120; shoe, 180; total, 1100 lb. The average running weight is 1010 lb. The weight of the die used, when new, is 140 lb. The stamps drop 6.5 in. 104 times per minute. Wooden guides are used, which last from 8 to 10 months; the wood is native and is extremely hard and of fine grain.

A cross-compound, slide-valve engine drives a line shaft running the batteries, eight having separate drive, while four are driven in pairs, 10 stamps to a shaft; however, the separate drive for each battery is preferable. Idler pulleys are used as belt tighteners. For the 60 stamps, 125 h.p. is required.

When crushing with double discharge it was found that an excessive amount of solution was necessary in order to maintain a proper wash in the mortars, from 10 to 12 tons being required per ton of ore. With single discharge, the same amount was crushed with 6 tons of solution. Chuck blocks are used to maintain the discharge at from 2.5 to 3 in., which is the hight of greatest capacity. The endeavor was to obtain as great a capacity per stamp as possible, with the condition of keeping the amount of coarse sand under 6 per cent.

Using woven-wire screens, crushing in cyanide solution carrying from 0.04 to 0.08 per cent. of CaO, the lime built up on the screens and choked them, closing the holes as with a cement. Frequent brushing was necessary to keep the holes clear, and this broke the screens; 30-mesh iron-wire screens were tried and discarded. Heavy punched plate having holes 0.6 mm. in diameter gave a properly sized product, and no trouble from lime deposition; but the capacity was low, since the holes were spaced too far apart and the plate was too heavy. Diagonal-slot screens, the slots 0.6 mm. wide, gave capacity, but as they rapidly wore to 1 mm. and larger at the lower end of the slot, the product was too coarse.

It was finally found that thin, punched, tinned screens gave the best results; these last 15 or 20 days as compared with 30 or 40 days when using the heavy plate. Their cost is such, however, that though lasting but half the time, the screen cost per ton crushed is one-third of that resulting from the use of heavy plate.

The stamp duty varies with the class of ore, from 3.5 to 4 tons, and the total cost of stamp milling is slightly under 49c. per ton.

The quantity of slime in the pulp from the stamps increases from 35 per cent. in crushing unoxidized ore to 45 per cent. in crushing a mixture of oxidized and unoxidized, the screens, discharge, drop and solution used being the same in each case. The pulp from the batteries is delivered to a V-shaped launder running to the sand-collecting tanks. The launder is set on a grade of 2.75 per cent., which is sufficient to keep the launder clear, when using 6 tons of solution per ton of ore.

The Sand Plant

There are four redwood collecting tanks, each 35 ft. in diameter by 4.5 ft. deep, fitted with pine filter bottoms supporting cocoa matting and 6-oz. duck filter cloth. The filter cloth is protected by 1.5-in. strips spaced 2 in. apart. The filter and strips take up 6 in. of the depth of the tank.

Each tank has a radial-arm distributor, and four side outlets for the overflow of slimes. The outlets are 4-in. pipes, and have a lattice and curtain in front to control the overflow. There are also four bottom doors. The pulp from the batteries is delivered to the hopper of the distributor and spread over the tank. The sand settles, while the slime overflows the curtains and is delivered to a launder running to the slime plant. As the sand collects the curtains are raised, the endeavor being to overflow as much of the slime as possible. A charge amounting to 145 tons drains to 15 per cent. of moisture after 30 hours.

Charges are allowed to stand as long as possible before transfer, usually 60 hours. The sand is then shoveled through the bottom-discharge doors to cars, and charged into the treatment tanks. The cars containing the sand are trammed over the treatment tanks on movable

bridges. Two cars are handled at a time; the sand is charged evenly over the surface of the tank and leveled off. The traveling bridges are a cheap and efficient means of filling the tanks, and no vibration is transmitted to the tank to cause settling and channeling of the sand. The work of charging, done by contract, costs 5c. per ton.

The leaching tanks, 14 in number, are the same size as the collecting tanks. The canvas filter is held in place by strips, ½x5 in., spaced 5 in. apart and radiating from the discharge doors, which protects the cloth while the sand is being discharged. The sand leaches rapidly and drains to 25 per cent. of moisture in 6 hr. After the first addition of solution and draining, the leaching cocks are left open for all succeeding leaches till the tank is ready to be discharged.

The solution from the slime plant, consisting of the decantations from the last treatments of the slime, is pumped to two supply tanks situated above the sand plant. This solution, which carries from 1 to 1.5 oz. of silver and from 0.03 to 0.06 oz. of gold, is brought up to a strength of 0.25 per cent. of KCN by addition of cyanide. This solution is used for the first or strong washes on the sand, being run on the tanks every 8 hr. with continuous draining. The tanks drain to from 22 to 25 per cent. of moisture between the additions of solution.

When the silver dissolves rapidly the addition of strong solution is stopped after three days, and solution from the slime plant is used without addition of cyanide. It takes from three to seven days to bring the undissolved value of the sand to less than 2 oz. of silver per ton. The charge is then allowed to aërate from two to three days.

The solutions from this first period of treatment are collected in a sump and pumped to the high-grade solution tank above the precipitation boxes. After precipitation, the solution is used for the barren leaches, being put on the sand after it has been thoroughly aërated. This precipitated solution, titrating from 0.15 to 0.25 per cent. of KCN, is used for from three to six days until the residue and undissolved values of the sand are approximately equal. When the leaches drop in value to 0.4 oz. of silver and 0.01 oz. of gold per ton, the tank is allowed to aërate a second time for two or three days. The leachings during this second period are collected in a separate sump. The sump solution, assaying from 1 to 2 oz. of silver per ton, is pumped to the second tank above the precipitation boxes.

After the second aëration, water washes, in lots of 10 tons each, are continued usually for two days, and the drainings drop to 0.1 oz. of silver per ton, a trace of gold, and a cyanide content of from 0.02 to 0.03 per cent. of KCN. After the final water washes, the tank is drained and sluiced to the river through the four bottom doors. It takes from 8 to 10 hours to discharge the sand, since the tanks are shallow. One man using a 2-in. hose, under a 40-ft. head, washes out the sand, the launders carrying the discharged sand having a 3 per cent. grade. The total time of treatment is approximately 18 days, which allows for from four to six days' aëration in the tanks. Without this aëration a much larger quantity of solution is necessary to accomplish the work.

A summary of the cost per ton of sand treated for a period of seven months,

TABLE 2. COST PER TON OF SAND TREATED.

Labor (native)	$0.1066
Employees (white)	0.0324
Cyanide	0.2367
Lime	0.1040
Filter cloths	0.0074
Shovels	0.0028
Pipe and sundries	0.0025
Miscellaneous	0.0130
Power	0.0934
Total	$0.5988

based on a total quantity of 23,925 tons, is given in Table 2.

The Slime Plant

The slime plant consists of two collecting tanks, 35 ft. in diameter by 9 ft. 6 in. deep, and ten treatment tanks, 24 ft. in diameter by 9 ft. 6 in. deep, with filter presses, necessary pumps, etc. All the tanks are of redwood with 3-in. staves. There is a 4-in. centrifugal pump connected to each tank. These pumps are driven by friction-clutch pulleys from a line shaft between the tanks, running at 800 r.p.m. They handle the contents of a tank in 1 hr. 15 min. The pumps have solution lubrication, and the runners and shaft last for two years. The runners, of the inclosed type, have given no difficulty in pumping thick or sandy slime, and have a much greater efficiency than open runners of the star type. Each pump requires 1.5 and each agitator 1 horsepower.

The treatment tanks are arranged in two lines of five tanks each. Each tank is equipped with a mechanical agitator consisting of two cross arms, driven by crown wheel and spur gear from a line shaft over the top of the tanks. The arms revolve six times per minute.

The pulp overflowing from the sand-collecting tanks is delivered by a 6-in. pipe, set on a 1 per cent. grade, to a box at the side of one of the 35-ft. slime-collecting tanks. At the opposite side of the tank is a slotted decanting pipe, through which the overflow of solution passes to the second tank. From the second tank a similar pipe carries the solution to the battery sump, whence it is returned to the battery-supply tank by the centrifugal pumps.

Slime charges are drawn from the collecting tanks, at intervals depending on the time of treatment and the tanks available, by a 4-in. centrifugal pump running 1200 r.p.m. This pump transfers a charge of 35 tons in 30 min. The charge, after transference from the collecting tanks, is agitated with pump and stirrer, settled and decanted. This operation is repeated, using weak precipitated solution. The number of treatments given varies with the ore. Practically all the gold is dissolved in from 4 to 6 hours after the first agitation begins, while the silver dissolves slowly and quite uniformly whether the pulp is being agitated or not.

The addition of oxygen from the air, necessary for the dissolution of metals by cyanide, is much better made to the clean solution before it is mixed with the slime, for it is much more soluble in clean solution than in a thick pulp, and therefore frequent additions of fresh solution are preferable to continued agitation of a thick pulp.

There are 10 tanks available for the treatment of slime; one is used as a supply tank for the filters, and of the nine remaining, two are at present used for the treatment of slime accumulated during the last years of the pan-amalgamation plant. With the seven tanks remaining, 70 hours are available for treatment, charging a tank every 10 hours. Four agitations are given, the first of eight hours and the three following of four hours each, which allows time for four 12-hour decantations and two hours for the charging of the tank and the transference of the charge to the filter-supply tank. The transference is done by the same pump used in charging the treatment tanks.

The filter plant has two Oliver continuous filters, each of 60 tons capacity, which were described recently in the JOURNAL. The cost before the installation of the filters was $1.21 per ton of slime. The filters reduced this to 91c. per ton.

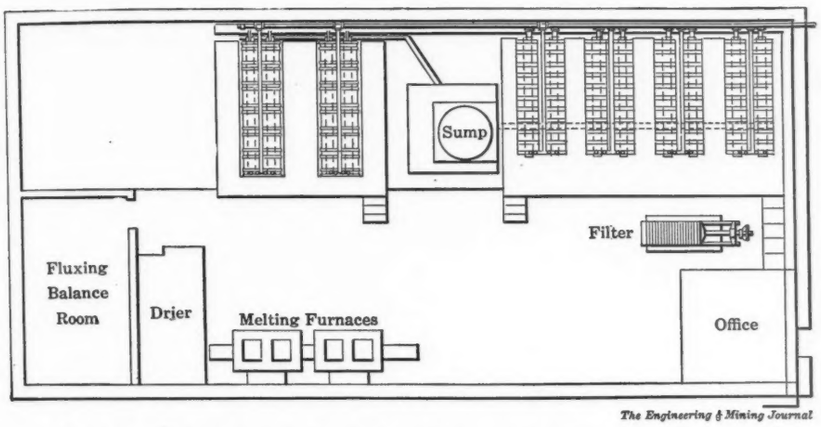
Precipitation

The solutions from the sand and slime plants are collected in sumps situated at the foot of the plant. Centrifugal pumps deliver the solution for precipitation to two tanks placed above the precipitation room, which is 40x80 ft. in area. A plan of this room, showing the position of the zinc boxes, furnace, etc., is given in an accompanying illustration. Along one side of the room are zinc-precipitation boxes of two types: eight are of sheet steel, having 10 compartments, 12x22x27 in.; 6-mesh screens are placed 5 in. above the bottom. The bottoms are hopper-shaped and discharge through 2-in. iron cocks to the clean-up launder, which delivers the solution and precipitate to the sump situated in the middle of the room on the side containing the boxes.

Two pairs of wooden boxes are placed on the other side of the sump, each having five compartments, 24x24x22 in., and

one compartment, 12x24x22 in., used for settling. The boxes have one side in common. The bottom slopes to the side, the precipitate being delivered to the sump by a launder along the side of the box. These boxes have 4-mesh screens placed 5 in. above the bottom. Both sets of boxes are set 3 ft. above the concrete floor, which is drained to a sump. The precipitated solutions flow to two tanks at the side of the building.

The precipitate is delivered on a screen over the clean-up tank, which is of redwood, 6 ft. in diameter by 4 ft. deep, and is fitted with a canvas filter. This tank drains into the sump, above which it is placed. The solution obtained from the clean-up is pumped by a 2-in. steam pump to a 24-in. Shriver filter press, holding 24 frames, the effluent solution from which goes to the head of the low-grade extractors. The precipitate is settled in the tank, drained over night, and put into the drier.



PLAN OF PRECIPITATION ROOM, SHOWING THE POSITION OF ZINC BOXES, FURNACES, ETC.

THE DRIER

The drier consists of a steel box with cast-iron plates for a base, resting on a flue shaped like the letter U. The flames from a small firebox at one end thus pass twice the length of the drier before reaching the stack. A small fire serves to dry from four to eight trays of precipitate, weighing from 440 to 1000 lb., in five hours.

Two grades of solutions are precipitated. The high-grade solution, consisting of the first drainings from sand plant, runs from 3.5 to 4.5 oz. of silver and from 0.15 to 0.25 oz. of gold per ton. Six of the steel boxes are used to receive this solution. Nine of the 10 compartments are filled with zinc; the last compartment being used as a settler. Each set of boxes contains 30 cu.ft. of zinc shavings. The rate of flow of solution has varied from 1.1 to 2.7 tons of solution per 24 hours per cubic foot of zinc; the precipitation is good at a rate up to 3 tons per cubic foot of zinc; above this rate it falls off.

The low-grade solution comprises the intermediate washes from the sand and the first decantations and carries from 1 to 2 oz. of silver and from 0.03 to 0.06 oz. of gold per ton. The low-grade solutions are precipitated in two of the steel and two of the wooden boxes. The rate of flow for the wooden boxes has varied from 4 to 8 tons of solution per 24 hours per cubic foot of zinc. The precipitation takes place almost entirely in the first two compartments. An interesting feature of the work is the regeneraton of cyanide. The cyanide strength of the solution leaving the boxes is greater than that of the entering solution.

CLEAN-UP OF ZINC BOXES

The boxes are cleaned up each week. Half the strong and half the weak boxes are cleaned one day, the remainder three days later. The boxes are all dressed with zinc on clean-up days. The fine zinc and precipitate is delivered by the launder to a No. 40 brass screen over the clean-up tank. The fine precipitate passing the screen settles on the filter cloth and the rate of filtration decreases. To avoid delay from this cause, the excess solution arising from the washing of the zinc is pumped from the top of the tank to a filter press. The fine zinc remaining on the screen is well washed with water and returned to the head compartments of the zinc boxes. In two years there has been no accumulation of short zinc.

The precipitate in the tank is drained over night and the following morning is placed in the drier. About 95 per cent. of the clean-up is obtained from the tank, the remainder passing to the filter press. The press is cleaned bi-monthly, the product amounting to about 250 kg. An hour is sufficient to clean the tank and place the product in the drier. To clean the press properly takes from 4 to 6 hours. A set of cloths for the press costs $26, while the filter in the tank costs $3. The durability is approximately the same, from 8 to 10 months. The amount of precipitate obtained each week is approximately 1000 pounds.

MELTING

Four furnaces, 18 in. in diameter by 26 in. deep, are used for melting the precipitate, using No. 80 Dixon and No. 100 Battersea crucibles. The fuel is a mixture of 3 parts charcoal to 1 of coke. Natural draft is used, giving ample heat. The crucibles are handled with a lever hung from an overhead track serving the four furnaces. Two natives, working from 12 to 16 hours, flux and melt the week's clean-up into bars.

The dried precipitate is broken up and bedded on a zinc-lined table and the flux added. The flux consists of: ground borax glass, 20; assay slag, 6, and sand, from 2 to 4 parts. The fluxed precipitate is put in manila-paper bags for charging.

The melts are arranged to give from 15 to 20 kg. of bullion, two melts going to make a bar. The bullion from the cones has a thin skin of matte, soft and malleable. The cones of bullion are remelted with borax glass and iron, the amount of iron used depending on the quantity of matte on the bullion. The iron serves to make a matte which is easily removed from the bars, and at the same time reduces the value of the matte by replacing some of the silver. The melted bullion is skimmed till clean, thoroughly stirred, two dip samples taken and then poured into molds. The bars are cleaned with dilute sulphuric acid. The average fineness of gold and silver during 1908 was 932. The skimmings from the bars are remelted with addition of excess of iron and 10 per cent. of sodium bicarbonate.

The costs of precipitation and melting, Table 3, are given together, as the work is interdependent. Two men are employed in the work, cleaning the boxes and melting. The zinc is cut in the machine shop, and the cost of cutting is included in the labor and power items. These figures are the average for a period of seven months, during which time 224,390 fine ounces of gold and silver were precipitated and melted.

TABLE 3. COST OF PRECIPITATION AND MELTING.

	Per Ton of Ore.	Per Fine Ounce, Gold and Silver.
Labor	$0.0174	$0.0032
Supervision	0.0168	0.0030
Zinc	0.0600	0.0111
Coke	0.0055	0.0010
Charcoal	0.0053	0.0009
Borax glass	0.0158	0.0029
Crucibles and covers	0.0044	0.0006
Power	0.0017	0.0003
Miscellaneous supplies	0.0030	0.0050
Total	$0.1299	$0.0235

The total cost for the year 1908 was approximately $1.50 per ton. During 1909 the cost per ton is lower ($1.372), largely due to an increased saving in cyanide made by the filters and to better quality of wood and cyanide.

Ore Dressing in the Coeur d'Alene District—VII

Theoretical Considerations of Factors Affecting Subsidence of Particles; Rapid Settlement the Desideratum; Efficiencies of Tanks Compared

BY EDWARD S. WIARD*

Up to the present point in my treatment of the subject of the ore-dressing practice in the Cœur d'Alene I have gone very slightly into the basic theoretical considerations. A better conception of the factors affecting flow in settling tanks will, however, be useful. Many times I have seen millmen exhausting their ingenuity on devices designed to reduce the entering velocity of pulp under the mistaken idea that so doing would reduce the rate of flow in the body of the tank. The effect of such device is merely to prevent eddies and currents.

Buoyancy of Liquids

Archimedes' principle is often stated as follows, "A body loses weight in a liquid equal to that of the liquid displaced." I regard this as a very unphilosophical statement. If we place a piece of rock in a beaker full of water and weigh it we shall find, having previously weighed the rock, beaker and water separately, that there is no loss of weight in the fragment of rock. If, however, the beaker of water rests on a stool over a balance pan and not in contact with it, and the fragment of rock be suspended in the water by a fine thread from the beam of the balance the beam will descend sharply though in perfect balance before the fragment of rock was immersed in the water. To restore the balance, weights must be put on the opposite pan to an amount equal to the weight of water displaced by the fragment of rock.

Consider for simplicity a unit cube of rock submerged at any depth in a body of liquid of specific gravity S. Let one of the sides be considered parallel to the surface of the water and let S' be the specific gravity of the cubical mass. If w is the weight of a unit cube of water and d the depth to which the upper face is submerged below the surface of the liquid, then the pressure on this face is evidently the weight of the column of liquid upon it, or dwS; that on the lower face, $(d+1)\ wS$. The difference in pressure between the upper and lower face is $(d+1)\ wS - dwS = wS$, which is the weight of the liquid displaced. If the liquid be water S becomes unity and wS equal to the weight of a unit cube of water. The pressure on the sides of the cubes balance one another.

If the piece of rock be irregular in shape the same relation will hold, i.e., the total upward buoyant force will be equal to the difference of pressure between the sum of the upward and the downward pressures which equals the weight of liquid displaced. If the rock be heavier than the liquid then the unbalanced force tending to produce downward motion is the weight of the particle minus the upward buoyant force. If we equate this expression against mass times acceleration we have, $VwS' - VwS = \frac{VwS'}{g}a$, where V is the volume of the particle, g the acceleration due to gravity (in a vacuum) and a the acceleration of the fragment. This gives, $a = \frac{g(S'-S)}{S'}$ i.e., in a frictionless liquid particles accelerate and the amount of such acceleration depends entirely on the specific gravities of the solid and the liquid. It will be noted that the acceleration can never be greater than g. If a substance lighter than the liquid in which it is immersed be considered we have merely to reverse S' and S. Thus a piece of cork of 0.25 sp.gr. would rise in a frictionless liquid of the specific gravity of water, if such a thing could be conceived, with an acceleration of $\frac{3}{4}g$.

Subsidence of Solids

Barus states that the subsidence of finely divided tripoli of all sizes in ether was practically instantaneous and resembled the fall of matter *in vacuo*. In his experiments equal amounts of tripoli powder were introduced into glass tubes containing different liquids and the depth of the clear liquid noted from time to time. The powder was so fine that in water the surface of the slime was but 2 mm. below the surface of the water after 16 hours of settlement; and after 180 days it had only dropped 25 mm. The ether column was absolutely clear in three-quarters of an hour. If a mixture of finely ground minerals were introduced into a flowing stream of ether they should settle out in the order of their specific gravity. This may be a valuable suggestion for a laboratory apparatus.

I have found that a uniform current can be started perfectly in a rectangular tank of small size by placing a pipe pierced with a line of holes across the bottom. Above the pipe I placed an adjustable curved shield against which the jets of water impinged. By turning the pipe and changing the angle of the shield I finally succeeded in finding a position for the two which gave me an almost uniform current. This was shown by sawdust introduced with the water. All particles in a vertical plane at the beginning of flow remained in the same plane until they reached the overflow. In the work with this tank the ore was introduced in a thin dry stream. If the ore had been introduced with water the whole current would probably have been spoiled.

The resistance of a liquid like water to the passage through it of solid particles soon reduces the motion of subsidence to a uniform one. For small particles it is proportional to the area of wetted surface and the velocity. For large particles the resistance appears to increase as the square of the velocity. For small particles the final velocity of subsidence for spherical grains in liquids is $V = \frac{2}{9}g\left(\frac{S-S'}{K}\right)r^2$ where r = radius of particle, S = its density, S' = density of liquid and K = coefficient of friction of liquid; Kirchoff's formula. For large particles of spherical shape Rittinger's formula (in c. g. s. units), $V = c\sqrt{D(S-1)}$ holds, D being the diameter of the particle, S its density and c a constant. Richards has shown that for galena the critical velocity and diameter come at 63 mm. per sec. and 0.13 mm. dia. For quartz 28 mm. per sec. velocity and 0.20 mm. diameter. For grains of larger diameters Rittinger's formula applies for smaller ones than Kirchoff's. This is the same as Stoke's formula used by Richards.

In all experimental work on the velocity of grains falling in water they have either been introduced separately into the test device or not in sufficient amount to affect the specific gravity of the liquid. If two beakers contain slime of 3 sp.gr., one to the extent of 10 per cent. of solids by weight and the other 25 per cent. then the respective specific gravities are 1.2 and 1.5. Such increases in the specific gravity of the liquid of course only prevail at the constant figure given so long as none of the slime settles. It will readily be seen from the formulas given that, considered merely as a statical problem, the velocity of subsidence must decrease as the percentage of solids increases. If particles are settling in a thick mixture there is a further retardation due to fast settling grains passing through the interstices of slower settling ones. Barus records the test the results of which are shown in

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the accompanying table, in which d is the length of column of clear liquid above slime.

SETTLEMENT TEST OF BARUS.

Hours.	d (Very Opaque).	d (Opaque).	d (Translucent).
234	12 mm.	35 mm.	50 mm.
331	20 mm.	50 mm.	77 mm.
385	29 mm.	60 mm.	90 mm.
408	33 mm.	65 mm.	96 mm.

The "very opaque" mixture contained the most slime and the translucent the least. This point has been discussed recently in the technical press. If slime containing a large percentage of solids be fed to a spitzkasten it will be found that it eddies and whirls slowly in the most extraordinary fashion. I attribute this action to some extent to changes in the specific gravity from point to point due to settlement.

Colloidal Slime Theory Not of Universal Application

The colloidal theory of slime will not apply to the majority of ores treated by wet concentration. I recognize that there are sometimes great differences in the settling rates of two slimes even when they show the same screen- and settling-test analyses, but the colloidal theory has not furnished an entirely satisfactory explanation for such instances of these differences as have come under my observation. There are substances not in the list of colloids so fine that they require days to settle in such a medium as water. It is a well known fact that there are particles in the air whose rate of subsidence is so infinitesimally small that they will be suspended for all time. The ore dresser requires settlement in seconds or minutes, so therefore his aim must be to make as little slime as possible so that what goes to waste from non settlement will be commercially negligible.

It is customary to estimate the velocity of flow in a tank in which there is a uniform current by the expression $\frac{Q}{A}$ where Q is the volume of pulp and A the cross-section of the tank. If A is the area of cross section of the water then the expression is correct. But in a rectangular tank the cross section of the water can only be gotten by adding to the depth of water to the edge of the overflow the head of water on the overflow and multiplying it by the width of the tank. The logical sequence of ideas in regard to the flow is, quantity of pulp entering the tank produces a head of water on the overflow and head of water on the overflow produces a certain rate of flow in the body of the tank. Discharge from an overflow or weir is only a special example of discharge from an orifice. For a thin slot in the bottom of a tank an approximate expression is $Q = \sqrt{2gh}.ba$, where b is the width of the slot, a the depth and Q the quantity of discharge. If the depth a has to be taken into consideration the theoretical expression becomes,

$$Q = \tfrac{2}{3} b \sqrt{2g} (h + h')^{\frac{3}{2}},$$

where h is the head on the lower edge of the slot and h' the head on the upper.

If the slot be considered as moved progressively up the side of the tank, h and h' become smaller and smaller, finally the upper edge of the slot emerges from the water and h' becomes zero; the expression then reduces to, $Q = \frac{2}{3} b \sqrt{2g} h^{\frac{3}{2}}$, which is the theoretical basic formula for discharge in weir calculation. It affords a means of obtaining the head of discharge from the volume of material entering a tank. This expression would only be theoretically true providing the cross-section of the tank were infinitely great. If not, then the velocity of approach, which is the figure with which the millman is concerned, will make a reduction in the theoretical head. In weir work the velocity of approach is usually of minor consideration. Where it must be considered, the head obtained from the theoretical expression is assumed to be increased by an additional amount given by the expression, $h' = \frac{V}{2g}$, where V is the velocity of approach calculated from the expression, $\frac{(d + h)w}{Q}$, in which d is the depth to the edge of the weir, w the width of the channel of approach and h the measured head of discharge, the channel of approach being of rectangular cross-section. The error in this approximation will be noticed at once.

The correction to be made for velocity of approach is so small that, for weirs, correction in the approximate way given is well within the errors of observation. For a full discussion of this point Trautwine or Merriman should be consulted. In the calculations which follow I assume that, $h = \sqrt{\frac{9Q^2}{8b^2g}}$, h being derived from the theoretical formula for Q.

Rectangular Tanks

The efficiency of two rectangular tanks of the same superficial spread and with equal depths of water in each is the same. If a grain will just settle to the bottom in a square tank at the overflow it will just settle to the bottom in a long narrow tank of the same depth and area. If the depth of the water to the edge of the discharge be the same in both cases the long tank will be slightly more efficient because the head of water will be greater. I assume in both cases that the length of overflow is the same as the width of the tank.

The above statements are true for perfectly uniform flow only. Practically, the square tank would be the better because the rate of flow would be less and there would be less stirring up of slime from eddies and currents. The converging current at the end of the long tank would be stronger and have influence for a greater distance back of the overflow than would be the case at the discharge of the square tank. The path of a particle settling in a rectangular tank would be, under perfect conditions, a straight line sloping downward toward the overflow. If the surface of the water be considered to be the axis of X and the axis of Y a vertical line at the end or point of entry of the tank, then the equation or path of a particle introduced at the origin is, $y = \frac{V_x}{m}$, where V is the rate of flow of the water and m the rate of subsidence of the particle, both in the same units.

Cylindrical Tanks

In a circular or cylindrical tank fed from the center and overflowing the whole perimeter the path of a settling particle is given by the expression, $y = \frac{m x^2}{2RV}$, which is the equation of a parabola. In this expression R is the radius of the tank and V the velocity of the cylindrical section at the overflow. The origin is considered in the surface of the water at the center of the tank, the axis of X in the surface of the water and the axis of Y a vertical line passing through the origin.

In a cylindrical tank the horizontal velocity along or parallel to the axis of X can be obtained from the following proportion, $V : v_x :: x : R$, or, $v_x = \frac{RV}{x}$, V being the velocity at the cylindrical shell at the overflow. It is evident from the ratio given above that the velocity must increase to infinity at the origin. If V be the velocity at distance R from the origin then the velocity v_x at any point x, must be inversely proportional to the distance from the origin. Now, $\frac{dx}{dt} = v_x = \frac{RV}{x}$, and, $x\,dx = RV\,dt$. Integrating, there is obtained the expression, $\frac{1}{2}x^2 = RVt$, $t = \frac{x^2}{2RV}$. In time t, however, the particle subsides the distance mt or y. Substituting $t = \frac{y}{m}$ in the expression $t = \frac{x^2}{2RV}$, there is obtained the equation of the path of a particle introduced into the surface of the water at the center of a circular tank, $y = \frac{mx^2}{2RV}$.[1]

If it be desired to determine the relative theoretical efficiency of circular and

[1] I am indebted to A. G. Plant, of the University of Montana, for aid in solving this equation. From my assumption that, $V : v_x :: x : R$, and that t along the axes was to be equated he deduced the expression for y.

rectangular tanks, this may be obtained in the manner described below.

Theoretical Efficiency of Circular and Rectangular Tanks

Let it be supposed that there is a circular tank of 20 ft. diameter and 4 ft. depth and it is desired to know how long a rectangular tank 10 ft. wide and 4 ft. deep must be to have the same settling power as the circular tank. Let it be assumed in either case that the flow of water entering the tanks is 2 cu.ft. per sec. From the expression, $Q = \frac{2}{3} b \sqrt{2g}\, h^{\frac{3}{2}}$, the head of water at the overflow of the circular tank can be determined. In this case b is the perimeter of the tank and h will be found to be about 0.03 ft. The depth of the water in the tank is then 4.03 ft. V is then determined as $\frac{2}{4.03 \times 2\pi R}$, the numerator being the number of cubic feet of water entering the tank. From, $t = \frac{x^2}{2RV}$, can be determined the time in seconds required for a particle of ore or water to travel from the center to the periphery. In this case x equals R, and t is found to be about 633 sec. or about 10.6 min. In the case of the rectangular tank with b equal to 10 ft., h will be found to be about 0.11 ft. As the water is 4.03 ft. deep a particle of ore of a size to just reach bottom in 633 sec. must have a vertical settlement rate of 4.03 divided by 633 or .0.00637 ft. per sec. In the case of the rectangular tank with b equal to 10, h will be found to be about 0.11 ft. Then 2 divided by 4.11×10 equals 0.0486 ft. which is the velocity of horizontal flow. At a vertical subsidence of .00637 ft. per sec. it will take particles mentioned above 645 sec. to reach the bottom of the tank. In this time it has advanced a distance 645×0.0486 ft. or 31.35 ft. This would be the length of the rectangular tank equal in theoretical settling power to the circular one. The area of the tanks are respectively 313.5 and 314.2 squart feet.

So far I have not considered the size grain which will just settle in these tanks, but a little figuring readily gives it. It is a grain of galena about 0.04 mm. in diameter. Theoretically, the rectangular tank is shown by the comparison to be better but practically it is inferior. The difficulty of creating a perfectly uniform current in a rectangular tank is insuperable. Indeed it is seldom tried. In the best settling tanks the water is commonly introduced from a box stretched across the width of the tank and having holes pierced in the side facing the overflow. This must create a sort of surface current breaking up into eddies and currents. In the case of the circular tank the theory shows that the velocity of entrance of the water may be comparatively great without in the least affecting its settling efficiency. The water may be introduced into the tank from the bottom, the distributing pipe rising vertically from the bottom and by suitable openings and deflectors a current can be created setting the whole body of water in motion in in the most efficient way. It must not be overlooked also that, although the converging current in the rectangular tank which has been discussed, is small, that in the circular tank is infinitesimal.

Outdoor Tanks Undesirable

In the Cœur d'Alene the situation of the settling tanks out of doors, and often at a considerable distance from the mill, has two serious objections. In the first place, from infrequent visits the distributing boxes are apt to be allowed to fill up partially or almost wholly with muck and trash. At one of the tanks I noted that the whole body of the water in the tank was in a whirl. The tank was 24 ft. long by 24 ft. wide and all but a few of the circular openings were closed with trash and slime. The discharge opening was a narrow one at the corner farthest away from where the water was entering. At the maximum the velocity of the whirl was 1 in. in 3¼ sec. The other great objection to the outdoor situation is that the water in the tanks is often exposed to long periods of zero weather. Barus has shown the effect of temperature on subsidence qualitatively. He introduced equal amounts of tripoli in two tubes containing water. One was maintained at room temperature and the other at the temperature of boiling point. The tubes were 15 cm. long. At the end of 24 hours the tube kept at the higher temperature was clear but the other had only subsided so as to leave a clear portion of but 3 mm. All who have undertaken mill work in tropical or semi-tropical countries such as Mexico have been impressed at the ease with which slime will settle in the warm water of these latitudes. The importance of warm water in mill work in our northern latitudes has been overlooked entirely.

German Foreign Metal Trade

Imports and exports of metals other than iron, in the German Empire, for the year ended Dec. 31, were, in metric tons:

	Imports.	Exports.	Excess.	
Copper.....	171,582	68,343	Imp.	103,239
Copper, 1908...	175,419	69,643	Imp.	105,776
Tin.....	13,700	7,936	Imp.	5,764
Tin, 1908.....	14,243	6,121	Imp.	8,122
Lead.....	77,294	42,692	Imp.	34,602
Lead, 1908.....	77,649	40,568	Imp.	37,081
Zinc.....	47,263	104,486	Exp.	57,223
Zinc, 1908.....	35,003	97,009	Exp.	62,006
Nickel.....	3,822	1,969	Imp.	1,853
Nickel, 1908....	3,119	1,604	Imp.	1,515
Aluminum.....	8,769	1,742	Imp.	7,027
Aluminum, '08.	3,278	1,232	Imp.	2,046
Miscellaneous....	1,190	11,269	Exp.	10,079
Miscellan's, '08	1,043	10,046	Exp.	9,003

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the year were, in metric tons:

Ores:	Imports.	Exports.	Excess.	
Gold ore.....	177	.....	Imp.	177
Gold ore, 1908	180	.....	Imp.	180
Silver ore.....	1,578	.....	Imp.	1,578
Silver ore, '08	1,742	5	Imp.	1,737
Copper ore....	26,488	22,498	Imp.	3,990
Copp'r ore, '08	17,456	21,729	Exp.	4,273
Tin ore.....	15,423	284	Imp.	15,139
Tin ore, 1908.	11,420	12	Imp.	11,408
Lead ore.....	111,017	2,556	Imp.	108,461
Lead ore, '08	133,597	1,189	Imp.	132,408
Zinc ore.....	201,110	52,026	Imp.	149,084
Zinc ore, 1908	199,840	39,450	Imp.	160,390
Nickel ore	10,186	.....	Imp.	10,186
Nickel ore, '08	17,102	.....	Imp.	17,102
Chrome ore....	22,018	5,023	Imp.	16,995
Ch'me ore '08	16,974	110	Imp.	16,864
Pyrites.....	691,213	11,566	Imp.	679,645
Pyrites, 1908.	659,871	16,384	Imp.	643,487
Miscellaneous.	6,150	661	Imp.	5,489
Mis., 1908....	4,926	676	Imp.	4,250

Miscellaneous ores include tungsten, molybdenum and other ores of the minor metals. Imports of slags and slag products were 562,853 tons in 1908, and 492,771 in 1909; exports, 74,821 tons in 1908, and 61,674 last year.

Cyaniding Cobalt Ores

Special Correspondence

The application of the cyanide process to the ores of the Colbalt district has been followed with close interest by all engineers, although the majority of them doubt its importance except a few cases. Cobalt ores are easily treated by concentration, and in the majority of cases 80 to 85 per cent. of the silver can be saved.

At the present time there are two cyanide plants in operation, one at the Buffalo and one at the O'Brien. The former treats only the slimes from the concentrator and, as far as can be learned, this method of treatment is giving excellent results as the ore contains a good deal of argentite which cannot be saved on the tables. The O'Brien mill is a combination concentrator and cyanide plant, part of the ore being treated by straight concentration and the rest cyanided direct, except that it is jigged before fine crushing. This process is rendered necessary on account of the character of some of the veins which contain large quantities of ruby silver and argentite. A test run was made on some of this ore before the mill was erected, and it was found that by straight concentration not more than 50 per cent. could be recovered.

The Nova Scotia mill, which is in course of construction, will also use the cyanide process, but the application will be different from either of the two plants mentioned. On account of the severity of the weather in the winter months, the cost of erection of cyanide plants is an important item, and for the great majority of the mills it is doubtful if the small additional saving that could be made would pay for their installation.

Tin Mining and Ore Dressing in South Africa—III

Waterberg Ores Occur in Pipes and Beds; Fine Crushing Customary; Elmore Process to be Tried on Arsenical-Sulphide Concentrates

BY E. M. WESTON*

The tin deposits of the Waterberg district of South Africa lie about 100 miles north of Pretoria, Transvaal, and are reached by the Northern line to Pietersberg. The center of the most northerly deposits is the town of Piet Poterigers Rust; of the southern, Warmbaths; and of the central, the station of Naboomspruit and the town of Nylstroom on the Nyl river.

Occurrence of Tin Ore

The accompanying sketch map, taken from the recently published report of the Transvaal Geological Survey, shows the chief geological features of the district. The youngest rock, the Bushveldt amygdaloids and sandstones of the Karoo system, are not directly connected with the tin deposits.

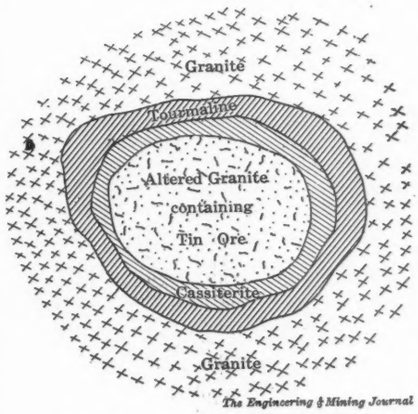
The tin ores occur in the Rooiberg sandstone, and in the granite and in felsites and shales near their contact with the sandstone. In this district it is the newer granite which carries the ore, rather than the older as in Swaziland.

The great bulk of production to date has been from the northern area, where the deposits occur in the new red granite. The ore-bearing zone is several miles in length, and has a width of about 1600 ft. Pipe deposits occur at Zaaiplaats and Groenfontein, while on the more northern and southern areas the deposits consist of more irregular bodies and impregnations along joint planes. On the latter areas, near the contact with felsite, the deposits are marked by the abundance of tourmaline.

The pipes may be described as roughly cylindrical orebodies about 3 to 10 ft. in diameter, and consisting of more or less altered granite carrying cassiterite. Numerous pipes have been worked on Zaaiplaats, two having been worked to about 500 ft. in depth along the dip. There is also a flat deposit of altered granite impregnated with cassiterite at Zaaiplaats and Roodepoort. Tin ore worth from £90,000 to £100,000 has already been extracted from Zaaiplaats, much of it having been shipped without any dressing other than by hand.

At Groenfontein a border of tourmaline becomes more frequently associated with the pipes, and pipes and "eyes" composed entirely of tourmaline are met with. A section of a pipe taken from the Geological Survey report accompanies this article. The principal pipe worked here, No. 9, is the largest so far discovered. It has been worked to a depth of over 500 ft., and has produced over 500 tons of ore worth about £40,000.

In the most northerly portion of the zone, and also in the southern district, the orebodies occur irregularly in altered granite and are more or less lenticular, following some horizon or line of weakness in the granite. Sometimes the ore impregnates the granite along each side of a fault plane as seen in the well known Cornish deposits. None of these



Section of Tin-bearing Pipe

are of large size, and none have justified mining on a large scale.

Origin of Deposits

Many of these deposits are similar to those which in other parts of the world are judged to be of pneumatolytic origin, *i. e.*, due to the action of vapors probably in the last stages of cooling of the mass. The formation of the pipes, however, is somewhat hard to explain, as it is hard to imagine lines of weakness in such form. Vapors under pressure in a semifluid mass might, indeed, boil up and force their way out, but this action would be rather cataclysmic; the granite in the pipes has evidently been subjected to metamorphism slowly by vapor and liquid. Several features, such as the occurrence of vugs, likewise make the theory of magmatic segregation untenable. Somewhat similar pipes occur in New South Wales and in Queensland.

At the Doornhoek the tin occurs in fissures in the shales, the lode proper consisting of brecciated fragments of country rock. The lode varies from a crack only up to 24 in. in width, but the surrounding shales are impregnated with tin ore in places for some distance along and near the bedding planes. In other places the tin occurs in the felsites themselves.

In the neighborhood of Zwartkloof tin ore occurs in irregular bodies of coarse granite, sometimes resembling irregular pipes, and at other times appearing to follow aplite veins. On this farm there is a large deposit containing 3,000,000 or 4,000,000 cu.yd. of materal which will be worked by hydraulicking, and which is estimated to have a recovery value of about 2s. per cu.yd. At Rooiberg the tin ore occurs largely in somewhat coarse crystals impregnating a quartzite along fissures.

Zaaiplaats Mine

The principal mines of this district have produced to date about £200,000, the chief producers having been the Zaaiplaats Tin Mining Company and Groenfontein Mines, Ltd. At the Zaaiplaats a 10-head battery has been running since early in 1909 and producing monthly about 90 tons of concentrate assaying about 70 per cent. tin. The deposits of this mine include a large number of pipes, of which 16 have been worked, a large body of rich ore of impregnated granite and a large area of alluvial oredeposits.

The ore from the mine is dumped over 1½-in. grizzlies and the oversize crushed to 2-in. cubes by a Blake-Marsden crusher. It is discharged into a 90-ton bin and fed by Challenge feeders to the stamps. A screen of about 22 mesh is employed. The pulp passes to four spitzlutten, the overflow going to four spitzkasten. The underflow from the first three spitzlutten is treated on Wilfley tables, and that from the fourth on No. 1 Frue vanner.

Two-thirds of the underflow from the first two spitzkasten is treated on No. 2, and one-third on No. 1 Buss slimer. No 2 also takes tailings from the Wilfleys and No. 1 takes tailings from the vanners. This arrangement, which may be convenient, seems to do away with any advantage gained by classification, as fine and coarse pulp is mixed again before treatment.

The middlings from the Buss tables are treated on a concave Cornish buddle. The concentrates from the Wilfleys and vanners are enriched in the tossing keive, as are also the middlings after treatment in buddles. The extrac-

*Mining engineer, 20 St. Mary's buildings, Johannesburg, South Africa.

tion is said to be from 85 to 90 per cent., and the cost about £3 per ton milled. This mill may be taken as typical of the district.

Rooiberg Mine

The ore deposits of the Rooiberg mine consist of a network of ore-filled fissures or lodes which is not confined to the areas covered by ancient workings. Many of these veins do not indicate their presence on the surface, and it is thought that there is a great likelihood that the fissures of the various areas of old workings are connected with each other and form one large mining area. The longest distance over which any single lode has been proved so far is about 2000 feet.

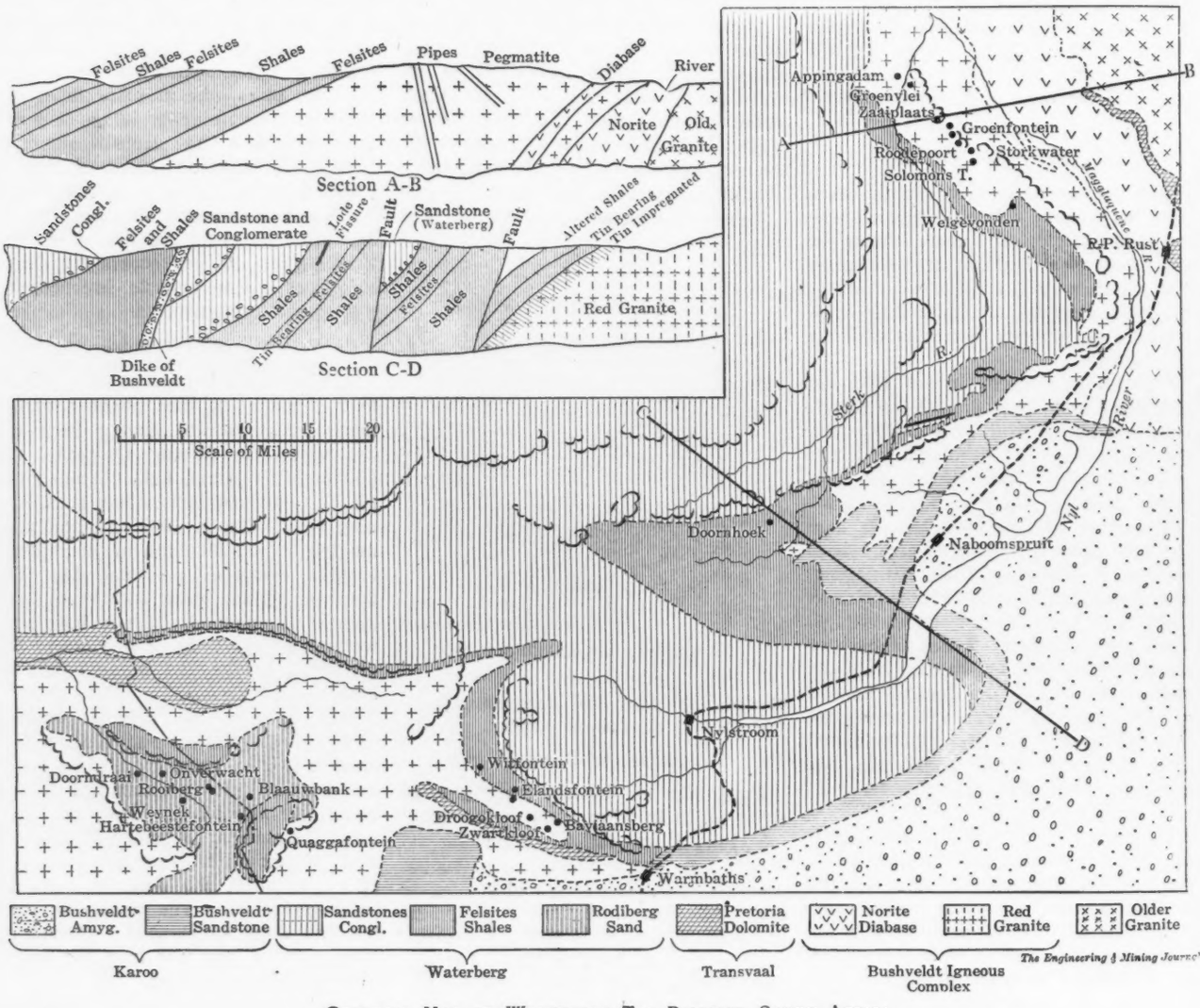
These lodes are irregular in width and value, the average width being about 2 to 3 ft. The smallest oreshoot encountered so far is about 20 ft. along the strike, and the longest nearly 400 ft. In one instance the existence of payable ore has been proved for over 120 ft. on the dip with ore still underfoot. Most of the oreshoots at present opened begin at a depth of from 30 to 40 ft. below the surface. The general average of the ore is from 4 to 5 per cent.

Most of the ore is suitable for concentration and the concentrates produced are of high grade. In deeper levels the occurrence of sulphides of iron and copper have to be expected, but it is not thought that such admixtures will be likely to interfere seriously with the profitable working of the lode.

The concentrating mill on this property is rather unique in South Africa, as it involves hand sorting and coarse concentration. The usual custom in South Africa is to crush the ore to great fineness, although the particles of tin ore in the rock are quite coarse. This plant is regarded to be more or less of an experiment.

The ore is rough sorted and hand fed through a Baxter crusher and there reduced to 2-in. cubes. It is elevated 40 ft. by bucket elevators and tipped over a 1¼-in. grizzly on which water sprays. The coarse ore then travels over a rubber sorting belt to ten 1050-lb. stamps. A 10-mesh screen is used. The pulp is elevated by a bucket elevator to a Callow tank, 4 ft. in diameter. The overflow goes to a second tank. The underflow is treated on two 40-mesh Callow screens. The oversize goes to three 3-compartment Harz jigs. These jigs have 3/32-in. sieve holes; the first and second work on ¾-in. stroke and the third on ½-in. stroke. These strokes seem large for this size of ore. The tailboards are 4½ in. The ragging consist of ¼ in. of shot and 1 in. of coarse tin ore. The tails go to waste.

The first hutch gives 68 to 72 per cent. tin concentrates; the second, 55 to 65 per cent.; third, 20 to 30 per cent., which are reground. The tailings assay 0.4 to 1 per cent. The concentrates from the first two hutches are sacked. The undersize from the Callow screens goes to spitzlutten. The overflow goes to Callow tanks whose underflows are treated separately on two Wilfley tables, which give a 65 to 72 per cent. concentrate, the



Geologic Map of Waterberg Tin District, South Africa

middlings carrying 8 to 20 per cent. tin. These middlings are reground in Holman grinding pans. The tailings assay 0.3 to 0.4 per cent. tin.

There are four Callow slime tanks which take slime from the grinding pans, overflows from the Callow tank before the jigs and from the spitzlutten. The bottom discharge of No. 1 goes to No. 1 vanner; that from Nos. 2 and 3 to No. 2 vanner; No. 3 vanner retreats the concentrates.

The stamp duty is 5 tons per day. The plant is being modified by the addition of Wilfley and Buss tables, and a Cornish buddle will be added to retreat the vanner concentrates. Suction gas engines furnish the power.

Elmore Process at Groenfontein

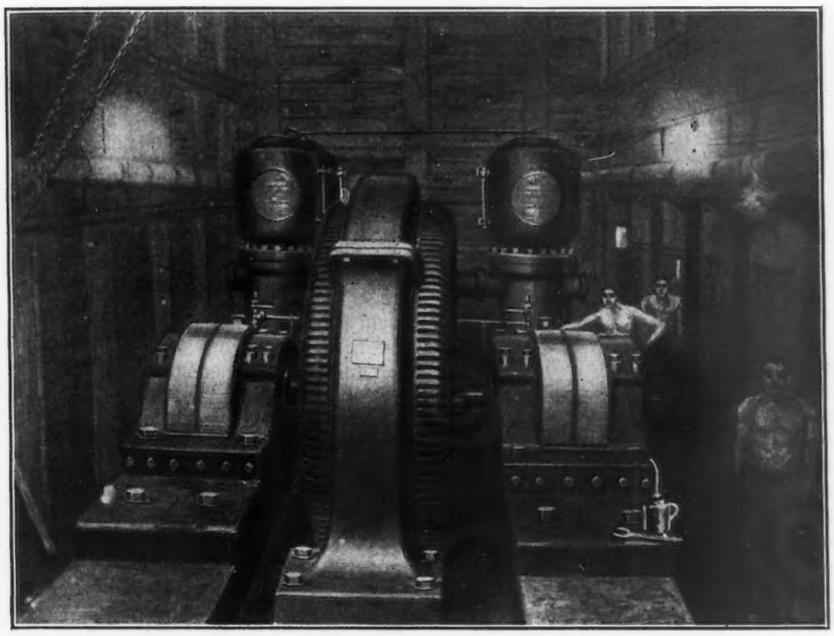
The mill on the Doornhoek consists of a rock breaker, 10 heads of 1350-lb. stamps, spitzkasten, two Wilfleys, four Frue vanners and a Wilfley and buddle with tossing gear. Difficulty is met here on account of iron pyrite, the concentrate above 60 per cent. being practically all slimes.

The ore-bearing fissure at Doornhoek has been opened up for several hundred feet in length and about 120 ft. in depth. The ore averages about 3 to 4 per cent. tin across a stoping width of 36 inches.

In all these mines arsenical and iron pyrites tend to increase in depth. To deal with this the Groenfontein mine intends to install an Elmore oil plant to treat the coarse concentrates containing arsenical sulphides without roasting. The process is a suitable one for this work, but is not applicable to slimes. None of the companies except, perhaps, Zaaiplaats, appear to have had the advantage of employing a slime concentration capable of making a separation between tin and pyrite, and the merits of the Luhrig vanner, which is largely used on the continent and in Australia for this work, appear not to be known.

Pumping Plant at the Ward Shaft, Virginia City, Nevada

In reopening the Ward shaft at Virginia City, Nev., a large flow of hot water was encountered, which for a time baffled the efforts of the workmen. The great depth of this shaft, 3480 ft., and the high temperature of the water, 175 deg. F., made the work of pumping unusually difficult. A temporary electric pump was finally successfully put into commission, and has since been supplanted by a permanent installation which easily handles the hot water.



Pumping Station on the 3100-foot Level, Ward Shaft, Virginia City, Nevada

Temporary Pumping Equipment

For emptying the mines, in the first place, a temporary motor-driven pump equipment was installed. Compressed-air sinking pumps at the bottom of the shaft lifted the water to a centrifugal pump on the 2330-ft. level. This in turn delivered to a vertical triplex pump on the 2100-ft. level. The sinking pumps were supplied with compressed air from two 100-h.p. Ingersoll-Sergeant compound air compressors driven by 100-h.p. Westinghouse motors situated on the surface. The three-stage Byron Jackson centrifugal pump on the intermediate level was belted to a 50-h.p. Westinghouse induction motor, while a 100-h.p. type "C" Westinghouse induction motor drove the 6¾x8-in. Knowles vertical triplex pump at the uppermost pumping level.

Permanent Pumping Plant

This apparatus has since been replaced by the installation of the permanent pumping plant placed in a pumping station 80 ft. long, 24 ft. wide and 20 ft. high, at the 3100-ft. level. The permanent pumping equipment consists of a special slow-speed, 800-h.p. Westinghouse type "HF" induction motor direct connected to a Knowles express type, duplex, double-acting pump, operated at 195 r.p.m. The valves are of the automatic poppet type arranged in nests of 13 each, presenting a valve area of 104 sq.in., which makes necessary very slight movement of the valves, and is conducive to a high speed and a minimum of wear. The valves and other visible parts are of bronze, and the pump has a capacity of delivering 1600 gal. per minute against a total head of 1550 feet.

The plant is equipped with a three-stage electrically driven air compressor for charging the air receivers, besides a vacuum pump and an automatic oiling system. For convenience of erection and repair, the pump station is fitted with a 15-ton traveling crane. The dimensions of each pump are 27 ft. 3¾ in. in length, 17 ft. in width, and 14 ft. 2 in. in hight. The motor is 13 ft. in diameter, and the steel crank shaft, forged from one piece, is 13¾ in. in diameter and 14 ft. 4½ in. long. The total cost of the installation was about $125,000. These pumps are supplied by either one of two centrifugal pumps at the bottom of the shaft, which are operated by special 75-h.p. Westinghouse motors on a vertical shaft.

The water is discharged through a 16-in. steel column with welded-steel flanges. The thickness of this pipe varies from ¼ in. at the tunnel level to 9/16 in. at the bottom. The column is supported by means of heavy iron clamps, six inches in length, which in turn rest upon the wall and end plates. To resist the pressure of 675 lb. to the square inch, male and female flanges are used and each fitted with a lead-filled copper gasket.

Electric Cables

The electric current is taken down the shaft at 2240 volts over a three-conductor, lead-covered, steel-armored cable of 400,000 circular mills capacity. The electrical equipment, from the automatic oil-circuit breakers on the surface to the motors themselves, is the best that money can buy, and in operation, with the splendid plants of the Truckee River Electric Company, results have been obtained never before approached for this class of work. The accompanying illustration of the present permanent pump house, 3100 ft. underground, was retouched from an actual flashlight photograph obtained during a recent visit to the mine.

Conditions Affecting the Coal-mining Industry

Forceful Arguments Showing That the State or Country That Exports Its Coal Is Sure to Fall behind in the Race for Commercial Supremacy

BY E. W. PARKER*

I was somewhat surprised to see in a recent number of *The Black Diamond,* an article, the argument of which was the possibility of securing a market for our "surplus" coal in Japan. The inspiration of this article seemed to come from the fact that the author had followed (he did not say accompanied) the Japanese royal commission from Chicago to South Bend, Ind., and interviewed one or two of the members on the subject of trade relations.

It seems to me that at this time, when one of the most important and interesting topics of discussion in the daily press, in the magazines, and in conventions, is the conservation of our natural resources, the writer or speaker who makes the exportation of such natural resources the burden of his song, is violently out of tune. We have been talking about the possibility of securing coal from China, when our own supplies approach exhaustion. Do we wish to hasten that undesirable contingency? My contention is that we have no surplus coal, and if I am guilty of riding a hobby, that hobby is opposition to the idea of building up an export trade in any of our raw materials, particularly coal. We have a big export trade in lumber, but already we are waking up to the fact that we not only need that lumber at home, but we are looking to Canada and other countries for some of our supplies. More trees will grow on the ground from which the timber has been taken, or the soil can be used for even more valuable agricultural products, but the coal once exhausted is gone forever. It is not replenished and the hole left in the ground will not yield any other product.

I am not an alarmist. In an official report which has recently been issued by the United States Geological Survey I have shown that so far as our knowledge goes the total exhaustion of our coal supplies, including half a ton lost for every ton marketed, down to the close of 1908, represents only 0.4 of one per cent. of the estimated original supply. That report also states that assuming the percentage of recovery in the future will be no more than at present, the quantity of coal now in the ground is 4913 times the exhaustion represented by the production in 1908.

*U. S. Geological Survey, Washington, D. C.

NOTE—Abstract of paper read before the winter meeting of the West Virginia Coal Mining Institute.

TOTAL PRODUCTION MORE THAN 7,000,000,000 TONS

The grand total of production to December 31, 1908, has amounted to 7,281,000,000 short tons, which at the rate of half a ton lost to every ton mined, is equivalent to approximately 12,000,000,000 tons exhausted. The total production of coal in 1908 was 416,000,000 tons. If it were possible in the future to extract and use 100 per cent of the coal in the ground (say, 3,000,000,000,000 short tons), we would still be able to take out 250 times the approximately 12,000,000,000 tons exhausted to the close of 1908. If we continue to lose a half ton for every ton mined, we can still produce 167 times the exhaustion to the close of 1908, or, say about 2,000,000,000,000 tons.

But the most uncertain factor which we have to take into consideration is the possible rate of increase the production in the future will take. We, the so-called experts of the Geological survey, have done some figuring on this matter, basing our calculations for the future on the records of the past. It is not my intention to rehash what you have already heard, but as an astute publisher of one of the big technical journals once remarked to me, "The public not only has to be told; it has to be reminded." For this reason I remind you that while our coal supply would last, at the present rate of exhaustion, nearly 5,000 years, it would all be gone in less than 200 years if our rate of increase in the past should continue during this and the next century.

I admit that we have frequently an over-production, and if the great common enemies of the coal producer and the manufacturer, the railroads, were to supply all the cars asked for, there would be an over-production all the time until the resources of a sufficient number of weaker companies were exhausted and enough mines closed down to bring supply and demand into reasonable relation. Then the railroads would have the surplus in car supply.

If the increase in production should be at the rate of 90 per cent. in each ten years, this rate of production—that is, the 200,000,000,000 tons a year—would be reached in the decade from 1998 to 2008. If the average increase for each 10 years were 80 per cent., the point would be reached in the succeeding decade; if 70 per cent., 10 years later. If the average decennial increase should be 50 per cent., the production reached in 1998 would only be 8 per cent. of what it would be if the increased production doubled each 10 years. Still by 2068 the production for 10 years would be equal to the total supply which exists today. The fact is that all of the coal would be gone 30 years earlier. If our production increased at the average rate of 25 per cent. for every 10 years, all of the coal would be gone by about 2125, or, in a little over 200 years.

In the course of a conversation with a prominent coal operator, a few days ago, I asked him what he thought would be the figure of maximum annual production of coal in the United States. He thought that when the annual production reached about 1,000,000,000 tons, the maximum figure would be reached and the production would remain fairly constant with, of course, such fluctuations as conditions of trade would produce. That started me on a new line of figuring. The average annual increase in coal production for the last ten years has been between 6 and 7 per cent.. If the production should continue at about a 7 per cent. increase each year, the assumed maximum output of 1,000,000,000 tons would be reached in the decade between 1915 and 1922, while if it increased at the average rate of 6 per cent. annually, it would be reached in the decade 1917-26. At the former rate the total production from the earliest times to the date of maximum production will have amounted to 17,816,243,000 tons, equivalent to an exhaustion of 26,724,365,000 tons. At an average of 6 per cent. increase the total production from the earliest times to the period of maximum output or constancy will have amounted to 18,844,840,000 tons, equivalent to an exhaustion of 28,267,260,000 tons. In either case the quantity of coal still left in the ground will exceed, 3,000,000,000,000, and if the production and also the percentage of recovery remain fairly constant the supply would last something over 2,000 years. What chance is there of making any predictions as to the future when, according to these estimates of increase in production, the period of exhaustion can be anywhere between 1998—or say 90 years hence—and 3925, or over 2000 years hence.

In a paper presented before the American Institute of Mining Engineers, at Spokane, last October, I was bold enough

to suggest that the time is not far distant when it will be necessary for the Federal government to exercise some restrictive control over the bituminous coal-mining industry, if the idea of conservation is to be carried out. Unless this is done it will be necessary, in order to protect the millions of dollars already invested, to control it by a community of interest such as now exists in the anthracite industry of Pennsylvania, or the creation of a monopoly such as the Standard Oil Company holds in the production, refining, and marketing of petroleum.

I have spoken thus on the coal-mining industry as a whole, although my paper is supposed to be about conditions affecting coal mining in West Virginia. I shall endeavor to limit the remainder of the paper to the field considered in the title.

West Virginia is the third in importance among the coal-producing States, being outstripped in this regard by Pennsylvania and Illinois. For one short year (1906) West Virginia, thanks to a rather prolonged suspension of mining operations in Illinois, pending the biannual adjustment of the wage scale, ranked second among the coal producers. As a coke producer West Virginia stands second, her closest competitor in this regard being Alabama. Twenty years ago, in 1888, West Virginia's production of coal amounted to less than five and a half million short tons. In 1898 it was a little over 16,700,000 tons. In 1907 it was nearly three times that of 1898, exceeding 48,000,000 tons. In a period of 27 years there have been only two in which there was a decrease in output—the panic years of 1895 and 1908, and the average annual increase in the 27 years has been nearly 1,500,000 tons. At a mining meeting more than a year ago, I called attention to the fact that West Virginia was shipping out of the State by far, the larger part of her production to feed the fires of manufacturing establishments in other States, and this coal she is shipping out is the highest grade of bituminous or semibituminous coal in the United States, if not in the world.

West Virginia the Loser Through Exporting Its Coal

West Virginia has an export trade. She is getting rid of her surplus. What is the result in the economic development of the State? West Virginia is third in the production of coal. Few States, if any, have shown such a rate of growth in coal production as West Virginia. It is a great record. But let us look at some other statistics. The United States census for 1905 shows that West Virginia is thirty-first in the value of her manufacturers, and there are only 45 States. The census report shows that the total gross value of the manufactured products of West Virginia was $99,000,000. Coke is included in this. In the census year 1905 Alabama's coal production was less than one-third that of West Virginia, and the gross value of Alabama's manufactured products was $10,000,000 more than that of West Virginia. Illinois's coal production in 1905 exceeded that of West Virginia by less than 700,000 short tons—less than 2 per cent., but the gross value of the manufactured products turned out by the factories of Illinois amounted to $1,400,000,000. Ohio's coal production in 1905 was only two-thirds that of West Virginia, but Ohio in that year had an outturn of manufactures worth $960,000,000, nearly ten times that of West Virginia. A large part of West Virginia's coal shipments go to New England. Massachusetts alone is credited with $1,100,000,000 worth of manufactured products. New York, which produces no coal but depends for her fuel upon Pennsylvania, Maryland, Virginia, and West Virginia, has a gross value of manufactures amounting to $2,400,000,000, in 1905, and Pennsylvania, the State that produces 50 per cent. of all the coal mined in the United States, had $1,955,000,000 worth of manufactured products in 1905.

The largest city of West Virginia, Wheeling, which in the census year 1900 had a population of 38,878, is exceeded in population by 97 cities in the United States, and yet West Virginia is the third State in coal production. Does it look like a paying proposition for a State to export its coal?

Look at it in another way. No one will claim that Illinois coal is comparable in quality with that of West Virginia, but in 1907 the average price for Illinois coal at the mines was $1.07 a ton; that for West Virginia coal was 99 cents. In 1908 the average price for Illinois coal was $1.05; for West Virginia, 95 cents. In 1907 the average price for West Virginia coal was the lowest for any State and in 1908 only one other State, Virginia (also a large exporter), had a lower average price than West Virginia. It may be argued that the strength of the miner's union in Illinois makes the coal cost more and renders a higher selling price necessary, but it is the home markets that make it possible to sell the coal at the higher price. Alabama coal is not better than West Virginia's product but it brought 30c. a ton more, and 31c. more, in 1908. West Virginia coke is certainly as good as that made in Alabama, but the average price at the ovens in West Virginia in 1908, was $2.00 per ton, while in Alabama the average price was $3.04. Alabama uses nearly all of her coke product in the furnaces of Birmingham, Ensley, Bessemer, etc., while most of West Virginia's goes outside the State. Could any more forceful arguments against the export of coal be presented than are shown by these figures? The State or the country that exports its raw materials is not keeping up with the procession.

The possibilties for West Virginia are enormous. Her coalfields are estimated to still contain over 140,000,000,000 tons of coal, over 30 per cent. more than the bituminous fields of Pennsylvania. Only 0.5 of one per cent. of the original supply of the entire State has been exhausted, and yet I have heard it stated that the New River field is expected to last only 100 years. The drain upon it is increasing rapidly and it is the best of the best that is going first. Is it not up to the public-spirited men of West Virginia to get together and take steps that will lead to the establishment of factories that will consume West Virginia coal at home, give employment to the class of labor that builds up desirable communities, and advance the happiness and prosperity of all citizens of the commonwealth?

More coal consumed at home will require a fewer number of cars. It will not be necessary for coal mines to shut down three days in the week for lack of cars, and the miners will be able to make a full week's wage. West Virginia should be one of the principal manufacturing States of the country. The coal operators of West Virginia are at a disadvantage as compared with those of other States for the lack of home markets for their product.

Illinois Coal Statistics

The total coal output of all mines in Illinois for the year ending June 30, 1909, was 49,163,710 short tons. This production shows a decrease of about 110,000 tons as compared with the output of the preceding year. Coal was produced in 55 counties; there were 384 shipping or commercial mines, as compared with 407 shipping mines in 1908. The average value of the coal per ton at the shipping mines was $1.012; the aggregate home value of the total product was $50,303,757. For haulage purposes underground there were 210 motors, 73 horses, and 5527 mules.

Mining machines were used in 107 mines, as compared with 105 mines in 1908. About 16,000,000 tons were undercut by machines, while 33,000,000 were mined by hand. There were 66,374 persons at work underground, while 6359 men were employed on the surface. The average price paid per gross ton for hand mining was 59c.; the average price paid per gross ton for machine mining was 46c. More than 1,280,000 kegs of powder were used for blasting coal. The number of men accidentally killed totaled 213, while of this number 14 were killed outside of the mine. The number of men killed to each million tons of coal produced was 4.3, as compared with 3.7 in 1908.

Mine Accidents Due to Disregard of Law

A resolution adopted by the recent convention of miners in Indianapolis declaring in favor of the office of mine inspector being entirely segregated from all political patronage, and that it should be filled by popular election, has occasioned James Epperson, mine inspector for Indiana to declare "that explosions and fires in mines, resulting in loss of life are due to wilful disregard of the mining laws." Mr. Epperson says that the Indiana department of mine inspection is continually crossing swords with men who disregard the law and when prosecutions are instituted without discrimination, the cry of politics is raised. "Indiana" Mr. Epperson declared, "has been fortunate in having few serious mine accidents, but since the mine-bit law was repealed at the special session of the legislature, the number of mine explosions have increased." Mr. Epperson says that "the principal danger contributary to explosion in mines is powder gas. We have had little trouble on account of firedamp because the Indiana mines are well ventilated, and it is our policy to see that they are kept well ventilated, as provided by law. Powder gas causes most of the trouble and powder gas can be controlled if the men will obey the law."

The Bit-law Repealed

Mr. Epperson deplores the repeal of the lesser bit law and says as a result thereof, a number of explosions occurred in 1909 killing and injuring a number of miners. He says, by reason of the heavy charge permitted by the larger bit and the violation of the law by the miners in tamping shots with fine drill dusts, the hazards of mining in Indiana has been greatly increased.

Mr. Epperson says that "one pound of coal dust exposed to the flames of a shot will generate 31½ cubic feet of carbon monoxide or white gas. Carbon monoxide has an explosive range extending from 1 volume of gas and 13 volumes of air to 1 volume of gas and 75 volumes of air. It has the widest explosive range of any gas except hydrogen. This is why the tamping of shots with coal dust is a dangerous thing. Carbon monoxide is the largest component of all the gases generated by the explosion of powder."

Mr. Epperson said that his department instituted 155 prosecutions for violations of the mining laws, and convictions were obtained in almost every case. "Prosecutions were instituted for the violation of every mining law on the statute books and the persons prosecuted included mine owners, mine superintendents, mine bosses, fire bosses and coal miners. We play no favorites or politics, nor will we do so."

Coal-leveling Machine for Beehive Ovens

Special Correspondence

What has proved to be one of the most remarkable inventions for assisting in the economical production of coke, since the birth of that important industry, is a new and unique machine for leveling coal in beehive ovens. This machine is now being placed on the market by the Covington Machine Company, of Covington, Va., the firm which a few years ago introduced the first coke-drawing machine.

One of these mechanical levelers has been in operation at the Continental No. 1 plant of the H. C. Frick Coke Company, Uniontown, Penn., for the past six months and has attracted so much attention that it bids fair to equal, if not outrival, the popularity of the coke-drawing machine. A brief outline of what this machine is accomplishing, both as a labor saving and money-making machine, is given below and should interest everyone whose interest is at all along the line of the production of coke.

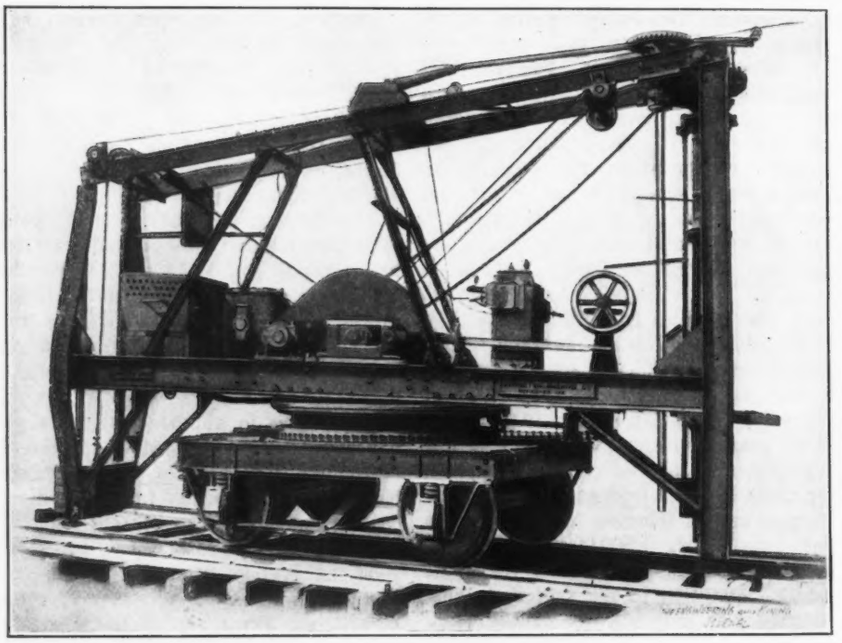


Fig. 1. Machine for Leveling Coal in Beehive Ovens

As an example, we give the record of the machine at the Continental No. 1 mine:

This machine levels 185 ovens per day, finishing its task within one minute after the last oven is charged. The machine is operated by one man and the labor-saving alone amounts to about $14.50 per day. In addition to the saving of labor, the perfect work of this machine makes it possible to not only burn off the usual charge put in an oven, but in addition allows the charging of approximately 7 per cent. more coal, thereby increasing the output of the plant, and makes into coke the coal which has heretofore been carted to the ash dump, due to the charge not burning off by reason of improper hand leveling. If the amount of coal carted to the ash dumps daily throughout the coke regions were known, it would startle those who are putting forth every effort to conserve our resources of this valuable commodity which is rapidly disappearing.

The proper leveling of the machine is not the only thing which makes it possible to burn more coal than is customary where hand-leveling is practiced. Where the machine is used, as soon as an oven is drawn the door is immediately bricked up and daubed before the oven is recharged, thus conserving so much heat that the new charge will ignite within one-third the time required where leveling is done by hand. This gives the coal longer to burn and has quite a little to do toward increasing the yield.

Description of the Leveler and Its Operation

The machine runs on the larry track, uses the larry trolley, and operates through the trunnel head, therefore, no expense is required for its installation.

The machine, as shown by Fig. 1, consists of a wheeled truck carrying a swinging frame, at one end of which is a vertical, sliding leveling shaft, which drops down through the trunnel head, and can be raised up clear of the track when desired. The truck is driven by a 20

h.p., standard railway-type motor, geared to one of the axles. A similar motor is mounted on the swinging frame, which drives the leveling shaft and raises and lowers same. Two controllers, a hand wheel and two levers bring everything under easy and complete control of the operator.

The main vertical shaft is carried in a sliding crosshead, which is guided by vertical ways and is raised or lowered by means of two wire cables wound on drums mounted on a shaft driven by friction bearing. This leveling shaft is partially counterbalanced. By means of a hand lever, the friction gearing can be thrown in, raising the leveling shaft, or by dropping the lever a brake comes into action, holding the shaft at any desired hight.

The leveling shaft, which drops through the trunnel head, is provided at its lower end by a pair of pantographic arms, which shut up between the head when going in or out of the oven, and are opened out to their full extent when leveling. The action of these arms is shown by the accompanying cuts; Fig. 3, showing the arms closed; Fig. 2, half open, and Fig. 4, full open.

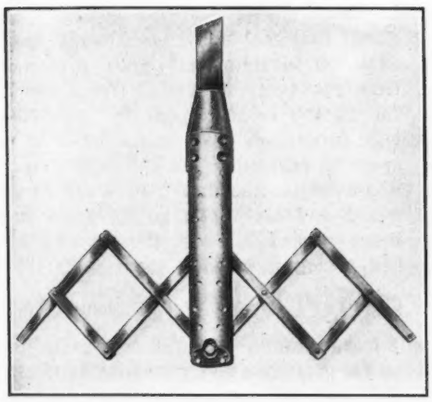


FIG. 2. SHOWING PANTOGRAPHIC ARMS HALF OPEN

FIG. 3. ARMS CLOSED

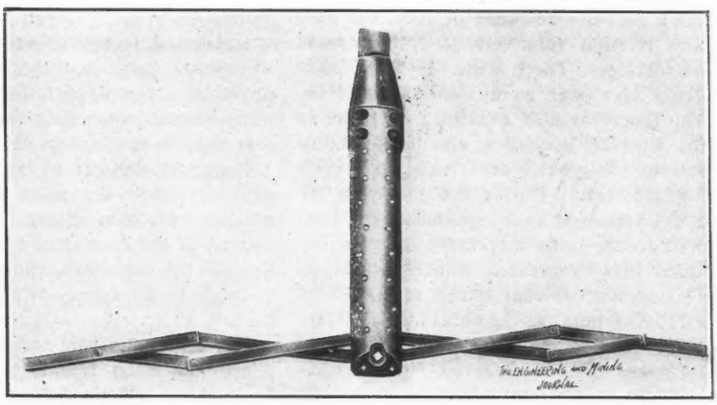


FIG. 4. SHOWING ARMS OPENED TO FULL EXTENT AS USED IN LEVELING

In leveling, the operator moves his machine near the center of the oven, adjusts it to the center of the trunnel head by the hand wheel, throws over the hand lever, causing the shaft to drop into the oven, and by means of the controller starts it revolving.

A friction device operates an internal nut, which, moving a plunger rod within the vertical shaft, opens out the leveling arms. By the time the arms are moved out to their full extent the oven is perfectly leveled. Reversing the motor closes the arms; throwing in the friction raises the shaft to its upper position, and the machine is ready for the next oven.

The machine can be built to level any size oven, and will operate equally as well on a double or single block of ovens. It is as active as a larry on the track, and is never in the way of the chargers.

Lehigh Coal and Navigation Company

This company owns a large estate in the anthracite region of Pennsylvania and operates a number of collieries. It owns and operates several short railroads giving outlet to its coal. It operates the Lehigh and the Delaware Division canals, connecting its property with the Delaware river. It owns the Lehigh & Susquehanna railroad, which is leased to the Central Railroad Company of New Jersey, forming the Pennsylvania division of that road. The company also owns a large interest in the Lehigh & Hudson River railroad, which gives it a line to the Hudson river and a connection with the Poughkeepsie Bridge line into New England.

The report for the year ended Dec. 31, 1909, shows that the capital stock is $21,002,750. This will be increased to $24,153,200 by the scrip dividend lately declared.

The coal tonnage for the year was, in long tons:

	1908.	1909.	Changes.
Coal sold	3,116,545	3,187,979	I. 71,334
Used at mines	347,733	397,671	I. 49,938
Total	3,464,378	3,585,650	I. 121,272

The coal sold in 1909 included 2,828,788 tons mined by the company, 224,927 tons mined by tenants on its lands and 134,204 tons mined by tenants of the controlled Alliance Coal Company. The income account for the year, condensed, is as follows:

Net earnings, coal department	$1,227,656
Rent, Lehigh & Susquehanna RR.	2,199,293
Other railroads	78,762
Miscellaneous	167,736
Total	$3,673,447
Loss on canals	$18,904
General expenses, taxes and interest	1,314,321
Depreciation and sinking fund	452,685
Total charges	$1,785,910
Surplus for the year	$1,887,537

From this surplus dividends amounting to $1,813,977 were paid, leaving a balance of $73,560. Surplus from previous year was $4,294,162; accounts adjusted, $1397; making a total of $4,369,119. From this is deducted $470,505, cost of isolating the Summit Hill colliery fire, and $3,150,412 for the 15 per cent. stock dividend; leaving $748,202 surplus at the end of the year.

The canals moved 328,990 tons of freight, 281,619 tons being coal. The lessee reports that the coal tonnage carried by the Lehigh & Susquehanna railroad was 8,274,752 tons, and its gross earnings were $8,682,352 for the year.

The net earnings reported for the Coal Department were 38.5c. per ton of coal sold. The coal used at mines and works in 1909 was 11.1 per cent. of the total mined, against 10 per cent. in the previous year.

The president's report says: "The general conditions surrounding the anthracite business during the year were not satisfactory. The congested condition of the coal market, due to the pressure to reduce large stocks of coal accumulated by some of the producers in 1907 and 1908, resulted not only in a low level of prices, but also in an irregular operation of the mines and a consequent high cost of production.

"The mining cost of your company was further increased by reason of the scarcity of water for colliery purposes, caused by the unusual drought which prevailed in eastern Pennsylvania during the late summer and fall; and, in fact, until the middle of December, making it necessary to operate at less than capacity such plants as were kept going.

"The necessity of maintaining mines Nos. 4 and 5 in idleness while the No. 5 breaker was being rebuilt also contributed to increase the cost of production, as did the fact that underground development work chargeable to mining was pushed at all operations throughout the year, in order to provide the increased mining capacity which will be needed as soon as the surface improvements under way are completed.

"It is proposed to increase the capacity of No. 10 breaker during 1910, if pos-

sible, so that the coal now handled at No. 11 breaker may be prepared at the former and at Coaldale breaker; and No. 11 breaker, which is out of date, will be abandoned or converted into a washery.

"The underground developments at No. 14 have been steadily prosecuted during the year, although the work has been materially delayed by unexpected difficulties encountered in removing an accumulation of water in certain of the old workings which will become tributary to this operation. It is proposed to complete No. 14 breaker plant during the next spring and summer, so that it may be ready for business in the autumn of the present year."

Mine Accidents in Pennsylvania

Inspector H. O. Prytherch, of the Fourth district, in his annual report for 1909 says that in the mines in his jurisdiction, the number of fatal accidents decreased and so did tonnage of coal produced, but he does not seem to think that the decrease in accidents bore any relation relatively to the decrease in tonnage. There were 25 fatal accidents last year as against 34 in 1908. The inspector also reports a decrease in the nonfatal accidents, and he attributes this to the greater care taken in reporting accidents. During the past year the coal companies have reported every accident to the mine inspector, and this enabled him to prevent similar accidents. The amount of coal mined in 1908 was 4,277,375 tons, as against 4,064,759 for 1909. The tonnage per fatal accident in 1908 was 129,167; for 1909, it was 162,159. In the 25 fatal accidents, rock-falls maintain their preëminence, there being 10 deaths owing to this cause. Six men were killed by gas explosions, two by exploding powder, three by premature blasts and three by electricity. The report from this district is satisfactory, for it indicates a substantial decrease not only in the number of fatal accidents, but what is of nearly as much importance, a decrease in the nonfatal accidents, many of which prove fatal in the end.

The reports of the mine inspectors from one cause or another are not prepared simultaneously, nor is it possible, the inspectors declare, to have them prepared at the same time, for the data upon which the mine inspectors build their reports are often delayed in coming to their hands. On the whole, however, this is rather an advantage than otherwise, for it enables the public to judge the reports of the inspectors separately and collate them one with the other. So far as the reports have been handed out to the press, the indications are that the more strict supervision exercised in the anthracite mines will eventually have the effect of considerably reducing the average number of accidents, particularly when taken in connection with the practical elimination of forged miners' certificates.

Mine Officials Blamed for Explosions

Officials of the Jefferson and Clearfield Coal and Iron Company, Indiana, Penn., are blamed by a coroner's jury for an explosion which caused the death of 11 miners at Ernest No. 2 mine, Feb. 5. After hearing testimony, the jury returned the following verdict:

"We find that the 11 men who met death in Ernest No. 2 mine, Feb. 5, were killed by afterdamp following an explosion of accumulated gas near the face of No. 5 room, off No. 11 entry; that the fire boss, William McLeavy, Mine Foreman John Harrington and Supt. William Reed had not complied with the laws governing the operation of bituminous mines in Pennsylvania; that Mine Inspector Roger Hampson, of Punxsutawney, has been lax in the inspection and negligent in the enforcement of mining laws in this mine. We approve the recommendations offered by the mine inspectors in their report and urge that the company adopt them."

Recommendations of mine inspectors who examined the mine after the explosion were that safety lamps be used instead of the open ones employed at the time of the explosion, and that a change be made in the supply of air to the workings.

The inspectors said today that no evidence had been found to show that a fireboss had examined the mine the morning of the explosion, and that gas was found after the explosion. An open light coming in contact with a pocket of gas, they said, caused the explosion.

A Company Formed to Mine Peat

Chicago capitalists have taken steps to establish a plant for the manufacture of peat fuel at a point near Fort Wayne, Ind. It is reported that the men interested have taken an option on 6000 acres of peat bog from which abundant material will be obtained. By mixing the peat with a small percentage of cheap coal chemically treated, a better and cheaper fuel than coal is said to be obtained. The plan is to put the new fuel on the market in a few months.

A consular report states that in some coal mines of the Nottingham district, England, the men want payment for their time going from the mine entrance to where they work, often a long distance. Instead of granting this, several mine owners are installing underground electric railways to transport the miners.

Continued Trouble Over Anthracite Mine Cave-ins

By Special Correspondence

On the evening of Feb. 14, 1910, a meeting composed of the members of the borough council, school board, the burgess and several citizens met in conference with the officials of the Clear Spring Coal Company, in West Pittston, Penn. The leading question was "what can be done to protect the public and private property in West Pittston from the settlements of the surface resulting from the collapse of the workings of the coal company." The answer on the part of the officials was that the company was doing everything possible to protect the mines and the surface. It was declared by the officials that the old workings are being supported with timber and gob piles with culm flushed in between.

This work has been costing the company from $275 to $300 a day. Joseph L. Cake, manager of the company declared that the latter has already spent $150,000 in trying to secure protection from squeezes; he further stated that as far as the money spent for protection was concerned, that would have to be spent in protecting the company properties owing to the inrush of water in the mines and the fact that the seam now being worked lies over the old Red Ash bed, which is causing the trouble.

Company's Interests Considered First

It was frankly admitted that in carrying on the protective policy the first consideration was the company's own properties and that the surface effects were a secondary consideration. Then the officials of the borough called attention to the damage which has already been done to the sewers, etc. To this question Mr. Cake declined a direct answer, pleading that it was a matter for the directors to take up and remarking that it would have a better chance for favorable consideration if the company was making money, which he declared was not the case at present, as the mines have been idle for some time on account of the frequent squeezes and caves.

The officials were then asked about the possibilities of future squeezes affecting the surface. To this answer was given that the people should not worry about it "because present ills are enough to find a remedy for." The surface owners did not seem to think that this was very soothing advice. Finally one of the borough officials suggested a trip into the mines to see just what sort of work the company was doing to prevent squeezes and caves. This was welcomed by the mine officials who declared that every courtesy would be shown to the investigating party.

PERSONAL

Mining and Metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Pope Yeatman has arrived in Chile.

B. B. Thayer has gone to Butte, Montana.

S. W. Mudd has returned to Los Angeles, California.

J. Parke Channing is expected in New York in about three weeks.

C. F. Rand, president of the Spanish-American Iron Company, is in Cuba.

L. W. Francis, secretary of Witherbee, Sherman & Co., Inc., New York, has gone to Cuba.

Archibald Johnston, first vice-president of the Bethlehem Steel Company, South Bethlehem, Penn., has returned .from Europe.

Dr. A. B. Willmott has removed his office as consulting engineer from Sault Ste. Marie to No. 24 Adelaide street, west, Toronto, Ontario.

S. R. Heakes, manager of the Kerr Lake mine, at Cobalt, has been appointed manager of the Wetlaufer mine in South Lorraine, Ontario.

C. A. Heberlein has returned to the City of Mexico from Achotla, Guerrero, having finished and put in successful operation a 50-ton lead plant.

A. E. Drucker, recently appointed consulting metallurgist for the Oriental Consolidated Mining Company, sailed from San Francisco March 15, on his way to Korea.

C. O. Moss, formerly manager of the Kansas City-Goldfield Mining Company's lease at Goldfield, Nev., is now superintendent of the Sierra Morena mine, near Paso Robles, California.

Wallace H. Weston, recently manager of the Copper Mining and Smelting Company in the Caballeros mountains near Cutter, N. M., is now manager of the Statehood mine at Hillsboro, New Mexico.

Hallett R. Robbins, of Seattle, Wash., has been appointed managing engineer for the Victory Mining Company, and is directing the operations of that company at the Ironsides gold mine near Boise, Idaho.

Karl Landgrebe, of Cleveland, O., has been appointed superintendent of Ensley Furnace division for the Tennessee Coal, Iron and Railroad Company, with headquarters at Ensley, Ala., effective Feb. 15, to succeed W. A. Gibson, resigned.

Horace Brock and son, John Penn Brock, vice-president of the American Iron and Steel Manufacturing Company, of Lebanon, Penn., are spending some weeks inspecting steel plants in Germany. It is understood that the company is planning a steel plant at Lebanon.

H. F. Braddock is now chemist with the Jamison Coal and Coke Company, of Greensburg, Penn. He was formerly connected with the fuel engineering department of the Arthur D. Little Laboratory, Boston, and with the testing laboratory of the Consolidated Coal Company.

L. S. Austin, late professor of metallurgy and oredressing at the Michigan College of Mines announces that he will take charge of and supervise examinations and reports on mining properties in Alaska, the western United States and in Mexico. His office will be in the Dooly building, Salt Lake City, Utah.

W. B. Trainer has been promoted from assistant superintendent of rolling mills at the Duquesne works of the Carnegie Steel Company to superintendent of the rolling mills at that plant to succeed Carl F. Maeder, effective March 1. Mr. Maeder has resigned to become general manager of the Western Steel Corporation, at Irondale, Washington.

Edward Flynn, of Pratt City, Ala., has resigned his position as chief mine inspector of Alabama, effective April 1, to accept the position of inspector of coal mines for the Tennessee Coal, Iron and Railroad Company, with headquarters at Birmingham, Ala. James Hillhouse, Sr., assistant mine inspector has been appointed chief inspector to succeed Mr. Flynn.

John D. Rockefeller, Jr., has resigned as a director of the United States Steel Corporation, and is succeeded by Henry Walters, of Baltimore, chairman of the Louisville & Nashville, and the Atlantic Coast Line railroads. An authoritative statement issued gives as Mr. Rockefelfer's reason for resigning that the holdings of stock in the corporation by the members of his family are not sufficiently large to justify his giving time or attention to its affairs.

The first iron-making establishment in Pennsylvania was a charcoal forge built by Thomas Rutter in Chester county, near Pottstown in 1708. This was followed in 1717 by a forge at Coventryville on French creek, also in Chester county, built by Samuel Nutt, an English Quaker. Nutt died in 1737, and his will made provisions for the erection of the Warwick furnace, which was built in 1738, by his widow, Anna Nutt, on the south branch of French creek.

OBITUARY

John C. Porter, Pittsburg, died February 17, aged 79 years. His connection with the iron trade began in 1862 as a member of the firm of McKnight, Duncan & Co., afterward McKnight, Porter & Co., manufacturing bar iron, bands and hoops. In 1880 he assisted in establishing the Spang Steel and Iron Company of which he was secretary and treasurer until 10 years ago, when he retired from active business life.

Charles N. Frost, president of the Frost Manufacturing Company, Kenosha, Wis., and prominently connected with the brass industry of the United States for 50 years, died Feb. 27, aged 66. He was a native of Waterbury, Conn. In 1866 he went to Kenosha and became superintendent of the plant of the Chicago Brass Company. In 1902 he retired and organized the Badger Brass Manufacturing Company, of which he was president for a number of years. Later, he organized the Frost Company.

George W. Sherling died at Birmingham, Ala., Feb. 26, aged 51 years. He was one of the pioneers of the Birmingham district, and had been prominently connected with mining there for 25 years. For several years he was connected with the Sloss-Sheffield Steel and Iron Company. Later he was for several years general superintendent of coal mines for the Southern district of the Republic Iron and Steel Company. For nearly three years past he had been president and general manager of the Eldorado Coal Company. He left a wife, three sons and two daughters. Mr. Sherling's funeral was the occasion of an unusual assembly of prominent mining men of the district. Among the pall bearers were J. W. McQueen, vice-president Sloss-Sheffield Steel and Iron Company; Walter Moore, president Red Star Coal Company; Maj. E. M. Tutweiler, one of the pioneers of the district, and for many years president of the Tutweiler Coal and Iron Company, now a part of the Birmingham Coal and Iron Company; Gen. E. W. Rucker, president of the Brilliant Coal Company; Henry B. Gray, lieutenant-governor of Alabama; Jones G. Moore, general superintendent of mines for the Sloss-Sheffield Steel and Iron Company; and W. A. Major, purchasing agent for the Tennessee Coal, Iron and Railroad Company.

SOCIETIES and TECHNICAL SCHOOLS

American Institute of Mining Engineers—A very fine portrait, painted by Richard B. Farley, Philadelphia, of Dr. Thomas M. Drown (one of the founders of the institute in 1871, a manager in 1872, secretary from 1873 to 1884, vice-president in 1892, president in 1897, and at the time of his death, in 1904, an honorary member of the institute, and president of Lehigh University) was exhibited at the Pittsburg meeting, and attracted much attention. This portrait has been presented to the institute by Dr. James Douglas and James Gayley, and may be seen hereafter in the Engineering Societies building, 29 West Thirty-ninth street, New York.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON IMPORTANT EVENTS FROM MANY IMPORTANT MINING CENTERS OF THE WORLD

San Francisco

March 4—Probably not more than 1300 men are at present at work in the Nevada county mines in the vicinity of Grass Valley and Nevada City. There is, however, some interest being manifested in the opening of a number of the older properties. As soon as the deep snow goes off the mountains it is also expected that there will be a number of people going into the Graniteville and Alleghany districts. At Grass Valley the North Star is working about 350 men and dropping all 40 stamps in both the Central and North Star mills, 20 of those in the latter being supplied from the Central workings. At the Empire the incline shaft is down nearly 3600 ft. and the 3400 North level is being opened from the shaft and from No. 2 winze from the 3000 level. Stoping is in progress below the 700 level to supply the 40-stamp mill. About 125 men are employed. Mark B. Kerr is opening up the Pittsburgh-Gold Flat mine situated between Grass Valley and Nevada City. Good showings of ore have recently been developed on the 900- and 1000-ft. levels north of the shaft and beyond the fault encountered on the 900 South. The shaft has been retimbered and enlarged, and sinking is in progress at a depth of 1070 ft. Development work is supplying ore for the 10-stamp mill. To the west of Nevada City, on Deer creek, the Mountaineer company is employing about 20 men on surface work and in sinking the new incline which has been sunk below the 400-ft. point. Concrete foundations have been placed for the head frame, shaft house, etc. At the Champion the company is working about 45 miners stoping and developing on the 800 and 1100 levels. Probably 25 tributers are at work in the upper Champion levels. All ore is being milled in the Champion 40-stamp mill. Pumping only is being done at the other mines of the group. Further west Frank Evans is operating the Oustomah under bond. The working force was recently reduced.

Butte

March 4—The walkout of the members of the International Engineers' Union No. 138 which began Feb. 16 and which resulted in the closing of the Butte mines because of lack of hoisting engineers, while still in effect, has been almost nullified so far as its effectiveness is concerned. The imported engineers have taken the places of the strikers so successfully that the camp has nearly resumed its normal output. President Matt Comerford, of the International Union of Steam Engineers, who was in Butte some time attempting to straighten out the situation, left a few days ago without having accomplished anything. A number of the striking engineers have deserted the cause and have applied for work, but it is understood that the new men who took their places will be retained as long as their services are satisfactory. Practically all of the mines in the camp are now operating although their output is less than normal. Several mines are using but two shifts of engineers, each man working 12 hours, instead of three shifts of eight hours each as formerly, but this will be changed when the supply of engineers is increased. It is practically assured there will be no further difficulty.

The United States Assay Office at Helena reports the receipt of $157,078 worth of precious metals during February. This is an increase of $15,335 over receipts for the same month in 1909. Chouteau county leads with $75,442. The citizens of Dillon have subscribed $12,000 for the purpose of assisting the Gilmore & Pittsburg railway to build into Dillon, and the railway has acepted the subscribed fund and agreed to begin construction work shortly.

Following the call of the special stockholders meeting of the Anaconda Copper Mining Company for March 23 for the purpose of increasing the capital stock of the company and amending the charter so that stock of other corporations may be bought and held by it, comes the notice of a meeting of stockholders of the Boston & Montana company in Butte March 26, when the plan of selling the entire property of the company to the Anaconda company will be put before the stockholders. It is probable that the other subsidiary companies of the Amalgamated will follow suit. C. F. Kelley, chief counsel for Amalgamated, has returned from New York and will be present at the meetings.

The local district court has appointed L. P. Donovan receiver of the Hypocka Mining Company, one of the old Heinze companies. The proceeding for the appointment of a receiver was brought by J. T. Haggerty who has an unsatisfied judgment against the company for $12,750. It is possible that the receiver will bring an action against the individual stockholders of the company to collect the judgment.

Denver

March 5—It is said that Thomas F. Walsh will work the Hidden Treasure and Pocahontas claims, in Imogene basin, San Juan county. These two properties on the same vein were acquired by Walsh, together with a large acreage of surrounding territory, after he had found the small streak of rich ore in the abandoned workings of the Gertrude (which was rechristened the Camp Bird), and which ultimately led to the bonanza which has made such a great mine. In 1882 the Pocahontas was being worked by the two owners, Bob Bell and "Kentuck," and showed in the upper level, which was the first one they drove, a shoot of ore about 100 ft. in length, varying in width from one foot to 18 in., and yielding from 95 to 250 oz. silver to the ton. In a lower drift on the vein, the ore was large cube galena, associated with resin blende, and running from 30 to as high as 160 oz. silver per ton. A mill run gave 101 oz. silver per ton and 42 per cent. lead. The character of the ore was galena and gray copper, associated with iron and copper pyrites, in a white quartz matrix. Whether deep workings on this vein will disclose gold ore remains to be seen, but the Camp Bird ore on the outcrop was low-grade galena. The elevation of the Hidden Treasure and Pocahontas is 11,200 to 11,500 ft., the latter being above timber-line. John W. Benson, formerly of the Camp Bird, is spoken of as manager.

In the Boulder oilfield, three wells were opened last week in a portion of the field hitherto thought to be barren, and about six miles north of the town. In the main field, a strike is reported on the property of the Inland Oil Company of 50 to 75 bbl. of oil per diem.

Salt Lake City

March 5—A portion of the so-called phosphate lands in Rich and Morgan counties, which were withdrawn from homestead entry pending an investigation of their mineral character, are once more open to entry according to word received Feb. 24 by the local land office. In December, 1908, the Secretary of the Interior withdrew from all kinds of entry lands in Utah, Idaho and Wyoming. The lands were not then known as phosphate-

bearing, but they included all areas in which phosphate might exist. These lands were examined and mapped during the summer of 1909 by the U. S. Geological Survey, and this has led to the restoration of a part of the lands to entry and to the withdrawal of others. A report on the phosphate deposits is expected to be published by the survey during the present year. Persons who made valid entries prior to the withdrawal of these lands may proceed with their entries up to and including the submission of final proof, but no purchase money will be received or final certificates of entry issued by the land office until further notice. The land restored is in Phosphate Reserve No. 2, and includes portions of township 4 north, range 3 east; township 5 north, range 3 east, and township 5 north, range 2 east. The land withdrawn includes parts of township 6 north, range 2 east; township 7 north, range 3 east and township 7 north, range 4 east, all of which are in Phosphate Reserve No. 6; also township 9 north, range 7 east, in Phosphate Reserve No. 7. Much of this land is valuable for agricultural purposes.

The receipts of bullion at the local United States assay office for the month of February were gold, $57,409, silver, $49. All of the bullion came from Utah mines. These receipts are the smallest since the office has been established.

The hearing in the case of the Silver King Consolidated vs. the Silver King Coalition was continued in the United States court in Salt Lake City last week. A number of miners who worked in the Parson's stope testified for the defendant as to the poor quality and large amount of waste in the ore. David Keith, president and director of the old Silver King Mining Company, and holding the same offices in the present Coalition company, was the principal witness for the defendant. He said that he had been in the Parson's stope frequently during the time it was being developed and worked, probably once or twice a month on an average. Mr. Keith said that no separate record had been kept of the mill ore, or shipping ore, or of the quantity of ore in this stope. The shipping ore was put into a common bin with ore from other parts of the mine. He had no means of knowing the tonnage of this, or of any other stope—nothing closer than an estimate. Regarding the quality of the ore, Mr. Keith testified it occurred badly mixed with waste and second-class ore; there was little ore of shipping grade. The thickest first-class ore he had seen was about 3 ft. in thickness, and occurred as streaks and bunches which would usually be worked out over night. The shipping ore frequently pinched out into milling ore; in nearly all cases it was surrounded by milling ore or waste. Particular emphasis was laid upon the large amount of waste in the ore.

The cost of mining, according to Mr. Keith, was $6 per ton, which is higher than in other parts of the mine due to the long distance from the shaft, cost of getting timber in, etc. It was necessary to do a large amount of development and prospecting in this neighborhood looking for a continuation of the main oreshoot which had been cut off near the Copper stope. The Jewel orebody, a continuation of the oreshoot, was found early in 1908 before the action for an accounting by the Silver King Consolidated was begun. All the work from the shaft to the Vesuvius-Montezuma claim line, 200 ft. from the Jewel stope, was charged to the Parson's orebody. The work charged aggregates more than a mile of workings.

On cross examination, Mr. Keith testified that the Dynamite drift on the 1225 level was one of the drifts run to prospect for the Jewel orebody beyond the Parson's stope. This was charged in the account.

Mr. Keith remembered of hearing of the large cave in the Parson's stope in December, 1906. He was in the stope in November before the cave, when, he testified, the stope was pretty well worked out. He did not think he was there afterward until counsel for the plaintiff showed him the *Park City Record* dated Dec. 22, 1906, giving an interview with him regarding this cave. Mr. Keith thereupon stated that caves were not unusual, and that it was customary for them to work the stopes in sections and, as soon as worked out, to let the stopes cave, or cave them purposely. He said he had helped do this himself by shooting out the timbers in some of the old stopes on the 900 level, and that it was better to cave them if possible than to let them stand. The general method of procedure in the Silver King was to work a stope in sections, and when a section was worked out, to cave it as soon as they could. It was customary, however, to clean up the stope before caving, that is, as Mr. Keith explained, to clean up small bunches of ore along the foot- and hanging-walls before the stope was caved. Mr. Keith himself testified that this was being done on his last visit to the Parson's stope before the large cave occurred.

From the time the ore was discovered in the Parson's stope to the time stoping was begun was a period of about three years. Mr. Keith was asked if he had not been in favor of letting the ore stand because it was owned jointly with the Silver King Consolidated, and if he was not overruled by the rest of the management about taking it out. He denied this, and said he was ready to begin stoping at any time, and that he had never had any hesitation about it.

According to Mr. Keith's testimony, the 1300 level was run for the purpose of discovering a continuation of the oreshoot which had cut off on the 1200 level near the Copper stope, 500 or 600 ft. east of the Parson's stope. It was run west past the Parson's raise looking for the continuation of the ore to the boundaries of the Vesuvius claim and beyond into the Montezuma claim. After discovering the Jewel orebody, Mr. Keith stated he thinks they were entitled to charge all of the work on the 1300 from the shaft to the Montezuma claim line to the Parson's stope, because it was the only stope developed on the 1300 at this time.

Birmingham, Ala.

March 7—Announcement is made that the Louisville & Nashville company has bought the 25 miles of railroad in Cullman county, Ala., belonging to the Cullman Coal and Coke Company, and will complete and operate it. The mining developments in Cullman county are coming along on a large scale.

The Montevallo Red Ash Coal Company has been organized in Birmingham, to open and operate coal mines at Montevallo in Shelby county. The incorporators and officers of the concern are: Albert N. Butler, president; Joel I. Butler, vice-president; Walter E. Crittenden, secretary-treasurer.

Announcement is made that by the use of a number of pumps the flood in the ore mines of the Sloss-Sheffield Steel and Iron Company, caused by striking an underground steam, is being reduced rapidly and before long the usual output will be made. The trouble at this place has disturbed the production of ore for several weeks.

Eight fatal accidents were reported as having occurred in the coal mines of Alabama in February, making 22 in all for this year so far. Of these, 19 were caused by falling roof in the mines. By constant warnings sent from the office of the State mine inspector it is believed that at least a partial elimination of these accidents will be brought about later on. The use of dangerous explosives in the mining industry in Alabama has been minimized by the operations of the State mine inspector's office and during the last winter not a serious accident from explosives was recorded in the mines of the State.

Cobalt

March 5—During the last week there were incorporated seven new mining companies with an aggregate capital of $5,790,000. This is the largest amount for some time and is due principally to new flotations in Gowganda.

In connection with the arrest of the high-grading gang, which caused such excitement some time ago, the Crown Reserve and other companies are suing for the moneys now held by Doctor Wilkinson, of Toronto, being the balance for payment of ore said to have been sold to

Doctor Wilkinson by the high-graders. The majority of the men arrested still have money coming to them, and the suit is being brought to settle the question of ownership definitely. The trial of Doctor Wilkinson and the others implicated is to come off shortly, and every effort is being made by the mining companies, who are prosecuting the action, to obtain a conviction.

Tenders for the 571 lots that have been surveyed in the Porcupine district by the Government, will be received until March 15. The townsite was surveyed by the Government, and the post office and recorder's office for the district will be situated there.

One of the most important events of the week was the finding of high-grade ore in the bottom of the Temiskaming shaft at a depth of 425 ft. This is the second deepest working in the Cobalt camp and the finding of a new oreshoot at this depth will be encouraging to the management of the Temiskaming. The vein consists of quartz and calcite and shows considerable free silver.

The Crown Chartered Gold Mining Company has purchased a plant consisting of a boiler, hoist, compressor, drills, etc., to carry on operations on the property at Porcupine. A portable sawmill is also being taken in. It is also stated that within the next few days a plant will also be ordered for the Forneri and Wright properties. These claims are nine in number and some excellent showings are reported.

The annual report of the Otisse company at Elk Lake shows that since its inception $86,730 has been spent. It also states that as rich ore as was first discovered on the surface has been found underground, but it is pockety. The total amount of underground work accomplished to date is 1396 ft. The report states that there is not as yet a sufficient quantity of ore exposed underground to warrant stoping. The veins are, however, as well defined as on the surface and warrant the expenditure of additional money to carry on further development.

Toronto

March 5—Hon. W. Templeman, Canadian Minister of Mines, has asked for an appropriation of $50,000 for investigating a process for the production of zinc, for making experiments and for any other purpose deemed advisable for the promotion of zinc production. The department proposes to undertake experiments and gather information abroad with a view to improving present processes and preventing the waste now prevailing in the treatment of zinc ores, especially in British Columbia.

Reports have been for some time current as to the finding of coal in the clay belt of northern Ontario to the north of the route of the Grand Trunk Pacific. It is said to be a semi-anthracite similar to the coal of Saskatchewan. Robert Shillington, Haileybury, has sent out prospecting parties to this region with the object of locating the deposits.

Hon. Doctor Reaume, Minister of Public Works for Ontario, announced in the provincial legislature on March 1 that the government would build a branch of the Temiskaming & Northern Ontario railway into Whitney and Tisdale townships to open up the Porcupine mining area.

London

March 2—The Ashanti Goldfields Corporation announces the formation of a subsidiary company, to be called the Ashanti Goldfields Territories, Ltd., for the purpose of prospecting about 118 square miles of its concession. The working capital proposed is £300,000 in 5s. shares. The corporation will receive £105,000 as the purchase price, nearly all of which will be paid in shares.

The prospectus of a new mining company, called the Esmeralda Consolidated Mines (Mexico), has been issued. The property to be acquired is the Esmeralda and three other adjoining mineral properties, situated in the district of Iguana, in the State of Nuevo Leon, Mexico. The prospectus is issued on the faith of statements made by J. J. Nicholl, mining engineer, and a clause to this effect is inserted in the prospectus presumably as a safeguard to the directors.

The report is of such a remarkable character that it deserves the attention of the mining profession. Enormous wealth is promised to the shareholders of this company. From the Esmeralda property there is an annual net profit of $20,000 waiting only the erection of a 25-ton concentrator to be realized. For an expenditure of only £500, a "manto," or flat orebody can be developed which might contain anything from £50,000 to £500,000 worth of silver. The Cocina mine on the Esperanza property, with a 25-ton concentrating plant, is expected to give a profit of £24,000 per annum. A 100-ton plant is recommended for the Guadalupe mine, the "practically illimitable" silver-zinc ores of which should produce at this rate of working a net profit of £108,000 per annum. Then there is a trifle of profit in the old dumps, which are valued at £600,000 net. Indeed, so valuable are these properties, acording to Mr. Nicholl, and so small is the sum required (£10,000) to "secure an ample dividend on the capital of the company" that surprise will be felt that the property should be put on the London market and that the vendors are asking only a beggarly £100,000 for a property of such fabulous richness. The prospectus states that Mr. Nicholl's report has been submitted to R. B. Symington, a mining engineer, of San Francisco, who, by cable, has generally confirmed the report and expressed his belief that the property has a great future.

Whether Mr. Symington has ever been on the property is not stated and it would be interesting to know whether he has or not. Another point in the prospectus worthy of attention is that the vendors are a company called the Industrial Selections, Limited, who, in December, 1909, purchased certain of the properties now offered for sale for £31,800 payable £1800 in cash and £30,000 in shares. It would be interesting to know if the properties now being sold for £100,000 were bought for a cash outlay of £1800, and what the words "certain of the properties" really mean.

Johannesburg

Jan. 28—The current "Gazette" contains an invitation from the Transvaal Government for proposals for the erection of a local plant for the manufacture of iron from scrap. This is a departure from the original proposal. Under the new scheme the successful applicant will be entitled to purchase 15,000 tons of scrap now lying at the Pretoria works of the Central South African Railways at 20s. per ton, and not less than 500 tons produced annually during a period of five years at the same price. Furthermore the Government will consider favorably readjustment of railway rates facilitating the transport of scrap to the works, and the discouragement of its export, as in the past large quantities have gone to Italy and some to Germany. The former proposal was that the Government should undertake the erection of a furnace jointly with the railway administration. In his memorandum issued about the middle of July, 1909, the Government mining engineer said: "It appears that there is a profitable and immediate field for the products of electrical furnaces which can turn out high-class steel with a comparatively small output per unit. It is recommended that the Government share the cost with the Central South African Railways on the pound for pound basis of establishing such an electrical furnace at a cost not exceeding £30,000, or £15,000 each. It may be expected that the object lesson provided by such a plant running, as may be reasonably anticipated, with success, will induce the installation of further plants by private enterprise." It would now appear that the preliminary demonstration is to be abandoned. A large portion of the Government mining engineer's memorandum was devoted to a discussion of the bounty system similar to that adopted by Canada. But the Government has been advised that such a system cannot be established without the consent of other parties in the Customs Union, so this will have to wait consideration by the Parliament. The scheme referred to above also contemplates "experimental work in the smelting of iron ores to the satisfaction of the Government."

THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY· INSTALLATIONS· DEVELOPMENT WORK AND PROPERTY TRANSFERS THE CURRENT HISTORY OF MINING

Alaska

Alaska-Mexican—An explosion of the powder magazine on the 1100-ft. level killed 23 men and injured 8 more, 4 of whom are expected to die. The magazine was 30 ft. from the place where the shots had been fired 20 min. before, and contained 275 lb. of powder.

Iditarod—Late reports from reliable prospectors say that a new strike has been made on Flat creek, where pay dirt extending along the creek for five miles has been found. The width of the paystreak is undetermined. The dirt is running from $2 to $5 to the square foot.

Arizona

Cochise County

Copper Queen—The winze in Lowell territory has reached the 1600-ft. level and drifting has been commenced both to the north and south. A station has also been cut at the 1500-ft. level in the winze and a drift has been started into the Hard Scrabble claim where ore is known to exist. Considerable ore has been stoped in Superior & Pittsburg ground along the Hard Scrabble-Del Norte line. Sinking below the 1600-ft. level has commenced at the Sacramento shaft in order to get clearance room below the ore pockets which are to be put in at this level. The drift on the 600-ft. level of the Spray has been run under the Holbrook shaft, and this shaft will be deepened by raising. The mule train on the 200-ft. level from the old South Nest stope will soon be replaced by a motor.

Bisbee Copper Mining Company—A tunnel is being driven to get under the old Gunsight vein.

Empire State—The 1000-ft. tunnel exposes about 150 ft. of low-grade copper ore, carrying a small amount of gold and silver. Prospecting from this tunnel is being continued.

Bisbee Extension—The shaft is now 660 ft. deep and in limestone. The company will sink to water level before drifting is commenced.

Calumet & Arizona—Recently four new drifts have been started to further prospect and develop the 1250 level of the Irish Mag shaft. The new drift on the 450 level is well out toward the ore-shoot that extends above the cave on the 550 level.

Superior & Pittsburg—Sinking has been discontinued at the Briggs shaft until the 1200 station has been cut, after which sinking will again be commenced. The main new drift on the 1450 level at the Oliver shaft is in about 400 ft. It is expected that ore will be encountered with about 300 ft. more drifting. At the Cole shaft the new orebody on the 1000 level has been thoroughly prospected and has proved to be a large body of rich oxide ore.

Denn-Arizona—The drifts on the 1350 level have been advanced about 400 ft. each way along the Dividend fault. A raise has been started to come up under the ore on the level above. On the 1350 a drift is also being run to the northwest. A body of sulphide has been encountered.

Tombstone Consolidated—With the two new boilers being installed, the plant will consist of 10 large marine boilers. An attempt will first be made to unwater the mine to the 1000 level where there are two pumps submerged. With the aid of these two pumps the pumping capacity will be about 14,000,000 gal. per 24 hours and it is estimated that there will be little trouble encountered in handling the water.

Gila County

Miami—Shaft No. 4 has been sunk in conglomerate to a depth of 601 ft. During the last week of February, 911 ft. of drifting, crosscutting and raising were completed. The company spends $25,000 monthly in underground development. It is estimated that the Miami concentrates will average from 30 to 40 per cent. copper, and that the total percentage of extraction from the ore will be between 75 and 80 per cent.

Arizona-Commercial—The east drift on the seventh level, following the Black Hawk vein, has passed through 20 ft. of 7 per cent. ore and has since been in material averaging between 2½ and 3½ per cent. copper, but containing considerable iron as well.

Live Oak—The company has issued its semi-annual report covering the period from its organization to Dec. 31, 1909. Of the 50,000 shares of stock, 11,000 shares have been issued, fully paid, and 39,000 shares part paid. The receipts have been $192,240. The disbursements amounted to $163,746. Cash on hand Jan. 1, 1910, was $28,494. To supply funds for future operations the management will make a call of $2 per share on all partially paid-up stock, payable April 1, 1910.

Colorado

Lake County—Leadville

Highland Mary and Bobby Burns—These claims, on Breece hill, are outputting about 50 tons per day of second-class ore. The ore carries a large amount of bismuth which must be sorted out.

Garbutt—This mine is producing about 50 tons of lead sulphide per day, which goes to the local smeltery.

Teller County—Cripple Creek

It is reported that the February production of gold was $1,206,527, the average value of all ore treated being $22.81 per ton.

Jerry Johnson and Arapahoe—The February production is given at 1200 tons, of a gross value of $24,000.

Doctor-Jack Pot—The dividend of this company payable March 1 was ½c. per share, and amounted to $15,000. During the year ended Jan. 1 the production was 6048 tons, gross value $148,092. Treatment and freight charges amounted to $44,674, making the net returns $103,-418.

El Paso—This mine shipped 2200 tons of ore of a gross value of about $44,000 in February. It is anticipated that when the lower workings are unwatered by the deep-drainage tunnel, the mine will be worked on company account.

United Gold Mines—The United Gold Mines Company is shipping 2000 tons of $20 ore per month.

Golden Cycle—That portion of the Golden Cycle mine under lease to Wilson & Co., produced 900 tons of ore in February, the value in gold being about $18 per ton. Two mining engineers are said to be examining this mine, with a view to purchase by English capital.

Bonanza-Midget—It is announced that the Bonanza-Midget company, organized three months ago, will pay a dividend of 2 per cent. on its capitalization of $500,-000 on March 10. J. W. Doepke is manager.

Gold Dollar—In a quarterly report issued by H. L. Shepherd, manager, it is stated that the cash received from royalties and ore shipments on company account is $5411 for the quarter, with a cash reserve of $15,743 in the treasury.

Stratton's Independence—January production was 2170 tons of ore averaging 25 dwt. 15½ grains per ton; dump ore milled, 6100 tons; net working profit, $13,600; expenditure on new mine development account $1250.

Idaho

Coeur d'Alene District

Ferguson Group—A bond of $17,000 has been taken on these claims near Murray by H. P. McGuire, of Seattle.

Alice—The mill is producing 20 tons of concentrates per day and this output will be increased soon. Present shipments have paid all the expense of running 2½ miles of tunnel, and the property is on a solid paying basis.

Golden Queen—Ore rich in gold has been struck.

Nabob—Eastern stockholders have agreed to take up 425,000 of the 500,000 shares of increased capitalization and the proceeds will be used in further development. A 100-ton mill is contemplated.

North Fork Smelting Company—A small smeltery for treating lead ores has been erected at Enaville.

Indiana

Sullivan and Greene Counties

Alliance Coal Company—A recommendation for the improvement of this company's mines in Sullivan and Green counties, involving the expenditure of half a million dollars in the effort to produce more coal and get it to the direct market without shipping to jobbers at Chicago, will be the result of a tour of inspection just completed by Frank R. Fisher, general superintendent of the company. He has visited the 14 mines owned by the company and made a thorough inspection of the Gilmbrour mine, northeast of Sullivan. The Alliance Coal Company is composed of Chicago bankers who purchased the Walsh holdings at a sale conducted by the United States Court six months ago. The proposed improvement will bring an increase of work to the miners of Sullivan and Greene counties and will greatly increase the value of the property. Superintendent Fisher said: "We have been shipping to Chicago, and we now propose to ship to Indianapolis and St. Louis markets instead. We will establish offices in both cities."

Kansas

Production for February was 4,247,570 lb. of blende and 229,210 lb. of lead ore with a total value of $92,649. Little has been done in the Kansas district during the last month. All prospecting work has been at a standstill and the large companies have been waiting for the weather to settle. The Big Six mine has broken into the ore at a depth of 170 ft. and has a continuous face of ore extending to about 300 ft. as shown by the drill holes. The Boston Mining Company has taken the O'Neill land and the Boughton leases from the Playters and is going ahead now to open up the properties. A steam shovel has been secured for the Boughton lease. Franklin Playter is manager.

There seems to be great probability of a new Kansas camp starting up at Playter. The Old Dominion Mining Company is planning the opening of its Newton mine at Playter. This is one of the few open-pit mines in the district. The ore is found within 6 ft. of the surface and after the overburden is removed with teams the 30- to 40-ft. face of ore is to be taken to the mill by means of an incline tram. The mill is to be enlarged to 300 tons capacity.

Michigan

Copper

La Salle—Regular rock shipments have begun to the Allouez-Centennial mill, rock coming from the stock pile of No. 1 Tecumseh shaft. The copper content of the rock has not been officially announced, but it should show the average yield for the Kearsarge lode. It is estimated that this stock pile contains about 30,000 tons.

Mohawk—Sinking and drifting is going forward at No. 6 shaft. The drifts in both directions from the first level have been extended about 30 ft. each way. Though the rock is not as rich as first exposed in the face of the crosscut, it is a good grade of stamp rock and is being sent right to the mill, shipments of about 40 tons being made daily. The shaft is down about 300 ft. and will be at the second level within a few days, when crosscutting to the lode will be started. An arrangement has been entered into between the Mohawk and the Ahmeek, which will be taken up for ratification at the annual meetings, for the exchange of land in section 28. This exchange will straighten the boundary lines of the companies and allow the No. 3 shaft of the Mohawk to be sunk to a depth of nearly 4000 ft., its present limit being less than 2000 ft. and will let the Ahmeek work about 80 acres additional through its present shafts.

Isle Royale—"A" shaft, sunk to cut the Baltic lode, is down below the 3d level without exposing copper in commercial quantities. The shaft is evidently sinking in the lode, as copper is encountered from time to time. Drifting is under way at the 3d level. About 1800 tons daily are being shipped to the mill from the other shafts. The February returns show nearly 17 lb. refined copper per ton of rock stamped.

Oneco—No. 6 drill hole is down about 550 ft. and should intersect the recently discovered amygdaloid lode within the next 200 ft. No. 7 hole, going down at a point about 2000 ft. away to cut the same formation, is down about 200 feet.

Hancock—No. 2 shaft is down about 2200 ft. on its way to cut the No. 2 lode. This shaft should reach the lode within a few days. The winze from No. 1 shaft, sinking on the No. 3 lode from the 13th level, is down to the 18th level, and at that point it will be cut by the second crosscut from No. 2 shaft, through which the rock from the 13th level down will be handled.

Section 12—This exploration company has made arrangements for the second drilling outfit to go into commission on its tract east of the Isle Royale, in view of exposing the extension the Baltic lode. This hole, No. 3, will be about 800 ft. north of the present operating hole. A drill core taken from the first hole showed what the management believed to be the Baltic lode, but it was without copper in commercial quantities, and its further opening will be watched with interest.

Missouri

Joplin Zinc-Lead District

Production for the month was 30,761,815 lb. of blende, 2,171,710 lb. of calamine and 5,552,550 lb. of lead ore with a total value of $804,445.

The Mining Club has perfected a permanent organization with 150 members and an assured income of $20,000 per year. This is the best effort the district has yet made for an organization to better the conditions of the producers.

Old Dominion—This company is branching out and has added two more properties to its list. These are the Binghampton, east of Joplin, and a 640-acre tract of land near the town of Ritchie.

St. Paul—This company is thoroughly drilling its land at Redings mill, south of Joplin, and is reported to have struck deep ore there. This is in practically new territory as this section has never been prospected.

Pike County Land Company—Two drills are at work prospecting the 80-acre fee recently purchased at Porto Rico.

McGee—This mine at Duenweg has sunk a new shaft and struck the silicate orebody at 73 ft., thus demonstrating the extension of the ore quite a distance beyond the present workings. This is the greatest silicate mine in the district and the life of the mine seems to be assured for some time to come.

Montana

Broadwater County

Black Friday Gold Mining Company—This company has recently been incorporated with a capital of $1,500,000 and has acquired eight gold-quartz claims near Radersburg, among them the Black Fri-

day which has made numerous shipments. A. B. Bennett is manager.

BUTTE DISTRICT

Butte Central—The stockholders have recently elected the following directors: Sir Francis Borden, of Ottawa; Harry W. Davis, of Wilmington; William H. North, Freeman I. Davidson, Francis A. Cave, W. H. Thompson and W. G. Burns, all of Boston; Sir Henry M. Pellett, of Toronto; Rudolph Forget and Mark Workman, of Montreal; Charles A. Henderson, of New York; William R. Tillinghast, of Providence; George G. Cragin, of Athol, Mass.; and John A. Condy, of Lynn, Mass. Preparations are being made to have the stock listed on the Boston exchange.

Tuolumne—The management states that the January output was 72,800 lb. of copper and $5491 in silver.

Butte & Superior—It is thought that new machinery will be installed at the Basin concentrator so that the ores may be crushed more finely, since with the present machinery considerable zinc is lost. The crosscut from the Black Rock shaft to the Colonel Sellers shaft is now in about 300 feet.

FERGUS COUNTY

New Mine Syndicate—A shipment of rough sapphires has recently been made from the mines near Utica to London, England, where they will be cut and polished and then reimported into the United States.

North Moccasin—The Bank of Fergus county has recently bought in the property of the company at sheriff's sale in satisfaction of a judgment for $121,634. It is thought that steps will be taken toward a reorganization of the company's affairs.

JEFFERSON COUNTY

Montana-Corbin—The management states that a 16-in. seam of chalcopyrite ore has been found on the hanging wall of the north ledge on the 400-ft. level, and 30 in. of 8 per cent. copper on the foot-wall side.

Corbin Metal Mining Company—The main shaft, sunk on the lead, is down 350 ft. The management states that a 2-ft. body of ore was discovered at a depth of 200 ft. and that it assays over 4 per cent. copper.

Robert Emmet—The management states that a concentrator will be built on the property in the spring. Development work has been done on the 200- and 300-ft. levels. The shaft is being sunk to the 500-ft. level where the veins will be explored.

LINCOLN COUNTY

Last Turn—The tunnel has cut a silver-lead vein at a depth of 160 ft. and a crosscut has been driven through the vein a distance of 15 ft. without reaching the hanging-wall. The group is six miles from Libby.

MISSOULA COUNTY

Montana-Standard—A concentrator is to be erected soon and shipments resumed after three years of idleness.

POWELL COUNTY

Maryland—This company expects to ship this summer, the ore to be taken out by way of Thompson Falls, Mont.

Elliston—A $100,000 bond has been taken by North Dakota people and the property is being operated under the management of E. R. McCartney.

Nevada

NYE COUNTY

Mayflower - Bullfrog Consolidated—Charles T. Dunbar, Henry Laub, E. S. Drury, F. H. Stickney, C. F. Ryan, L. P. Kimball and J. Lemle, the newly elected directors, who replace A. C. Eisen and his associates in the control of the affairs of the company, have entirely changed the plans of the old directorate. The property is to be worked by a newly organized leasing company, composed of original Mayflower stockholders.

STOREY COUNTY

The project long under discussion of combining the various properties on the old Comstock Lode in Nevada for the purpose of clearing the lower levels of water and through coöperation attempting to resume operations on a large scale has taken definite form through the formation of a committee. The mines represented include the Consolidated Virginia, Ophir, Mexican, Potosi, Crown Point, Chollar, Utah, Yellow Jacket, Belcher, Savage, Sierra Nevada, Justice, Bullion, Union Consolidated, Imperial, Exchequer, Best & Belcher, Challenge, Kentuck, Gould & Curry, Confidence, Alpha, Hale & Norcross, Alta, Overman, Lady Washington and Julia. This committee represents the majority stockholders of the 27 companies on the lode and invites the deposit of shares with the Bankers' Trust Company, of New York, or the Crocker National Bank, of San Francisco, subject to approval of a plan of reorganization.

The call for the deposit of stock is signed by Franklin Leonard, Jr., president of the Comstock Tunnel Company, Adolph Lewisohn, Ernst Thalmann, A. L. Scheuer, W. C. Ralston, James McNab, J. Parke Channing, B. F. Shaw and Charles A. Ellis, who, the announcement says, have been appointed a commitee to formulate a plan for coöperation by consolidation of the mines, exchange of stock or otherwise, "to the end that the same may be placed upon a larger producing basis by means of ample capital and modern methods."

WHITE PINE COUNTY

Giroux—Two compartments of the new shaft are now below the 1100-ft. level, and will be carried downward as rapidly as possible until the 1200-ft. level is reached, when a station will be cut and pumps installed. From the 1200-ft. level a crosscut will be run to join the 1200-ft. level of the Alpha shaft. The two are already connected by a drift at the 1000-ft. level and a big block of stoping ground will be thus established.

Oklahoma

Production for February was the smallest for many months, being only 1,888,760 lb. of blende and 618,965 lb. of lead ore with a total value of $40,402. The Quapaw Gas Company is laying its pipe through the Miami camp and Quapaw and these camps will soon have gas fuel instead of coal. The Omaha-Petersburg Mining Company is to build a new 500-ton mill north of the Mission mine at Quapaw. A local company has been organized at Baxter Springs to build an electric railway from Baxter Springs to the Miami mines.

South Dakota

Homestake—The plant is again operating at its full capacity of 1000 stamps.

Utah

BEAVER COUNTY

Wild Bill—A strike was made on the 300-ft. level. This property is held under a bond and lease by G. S. Wilkins and F. T. Leonard.

South Utah Mines and Smelters—A copy of the articles of incorporation of this company, organized at Augusta, Me., was filed Feb. 28 with the secretary of state. The capital stock is $4,300,000 in shares of $5 each. The officers are L. N. Kramer, president; John Josten, secretar; C. H. Parsons, resident agent for Utah.

Leonora—A vein of carbonate ore about 18 in. wide was broken into in the lower tunnel of this property in the Star district. The company has been reorganized and is now under the management of Salt Lake people. C. N. Christensen is superintendent.

Majestic—Ore is exposed on the 500-ft. level of this company's Harrington-Hickory mine for a distance of 110 feet. The shaft is down about to the 550-ft. level and sinking is being continued. A carload of ore is now at the smeltery and it is stated that weekly shipments will be maintained regularly.

JUAB COUNTY

Tintic ore shipments in carloads for the week ended Feb. 26 were as follows: Dragon Iron, 21; Iron Blossom, 19; Colorado, 17; Sioux Consolidated, 15; Opo-

hongo, 2; Centennial-Eureka, 43; Gemini, 3; Grand Central, 8; Eagle & Blue Bell, 3; Uncle Sam, 2; Victoria, 2; Chief Consolidated, 4; Scranton, 6; Beck Tunnel, 2; Swansea, 1; North Cliff, 1; Eureka Hill, 1; Ridge & Valley, 3; Mammoth, 2; Yankee, 1; May Day, concentrates, 1; total, 157.

Lower Mammoth—A strike was made in a raise from the 1800-ft. level. This is thought to be the continuation of an orebody which was opened on the 1700-ft. level and from which a large tonnage was mined. On the 2000-ft. level a drift is being run to look for the continuation of the ore at this depth.

SALT LAKE COUNTY

Bingham Mines Company—The annual report shows net earnings for the year to have been $55,774. The company retired $331,000 first-mortgage bonds of the old Bingham Consolidated, its predecessor, leaving $572,000 still outstanding. This has brought down the annual interest charge from $54,180 to $34,320. The company is making regular shipments from its Bingham and Tintic mines.

North Utah—The drift on the 227-ft. level of the Butler Liberal section has been driven several hundred feet through ore. This orebody has been opened on a lower level south of the shaft, and has largely added to the available tonnage.

Yosemite—A strike of silver-lead ore is reported 100 ft. below the level of the old Paradox tunnel. This is said to be the continuation of an orebody which was stoped above the tunnel level some years ago.

Washington

FERRY COUNTY

Tom Thumb—This mine is under lease to A. R. Sweet and O. B. Collins, of Republic. About six cars of ore are being shipped per week.

Copper Key—E. L. Tate, manager, reports that the orebody, for which such a long search has been made, has been found.

STEVENS COUNTY

Imperial—Development work will be started on this property three miles north of Chewelah in the spring.

Wyoming

ALBANY COUNTY

Jupiter—The company is preparing to install machinery sufficient to sink a 500-ft. shaft the coming summer.

Rambler—Work is being pushed on the mill. Tests, it is claimed, show the concentrates to carry 1 to 6 oz. of platinum.

Canada

BRITISH COLUMBIA

Consolidated Mining and Smelting—The Trail smeltery treated 36,840 tons of ore in the copper furnaces and 4673 tons in the lead furnaces during January. The production was 14,712 oz. gold worth $301,363; 205,232 oz. silver worth $109,036; 617,064 lb. copper worth $84,109 and 3,443,509 lb. lead worth $101,697. There were 43,344 tons of ore received, of which 34,507 tons came from the company's mines.

ONTARIO

Dominion Iron and Steel Company—At a meeting of the directors of the Dominion steel and coal companies, at Montreal, March 4, the balance of damages due to the steel company by the coal company was fixed at $800,000, and arrangements made for its settlement. This enabled the steel company to declare a dividend of 31½ per cent. on preferred stock, covering all arrears, as well as the dividend falling due April 1.

ONTARIO—COBALT

The shipments from Cobalt for the week ended Feb. 25, were as follows: Kerr Lake, 350,000; La Rose, 212,565; Nipissing, 127,437; Crown Reserve, 61,153; City of Cobalt, 64,000; Silver Cliff, 66,010; total, 881,165.

Buffalo—In January 2770 tons of ore were treated in the mill and the silver recovery was 103,549 oz. at a milling cost of $6572.

La Rose—A new vein has been cut in the stope from the No. 3 working. The vein is about 6 in. wide of high-grade ore.

Right-of-Way—A 2 per cent. dividend has been declared on the new capitalization. All the work is now being carried on at that end of the property adjoining the McKinley-Darragh.

Bailey—Ore has been exposed in the vein about 25 ft. below the tunnel level.

Rochester—A 5-in. vein reported to be rich has been encountered at the 75-ft. level.

Mexico

CHIHUAHUA

San Francisco—John R. Roslyn and New York associates will drive a 1000-ft. development tunnel to open up this mine in the Naica camp. Machinery is to be installed.

Rio Plata—In January this company crushed 1706 tons of ore containing 93,872 oz. silver for a total production of 71,164 oz. worth $33,310. Tailings containing nearly 20,000 oz. were stored. The operating costs were $13,464 and operating profit was $20,047.

El Rayo—The mill crushed 4700 tons of ore in January for a production of $62,107. The ore averaged $12.55 per ton, and the extraction was 80 per cent. Operating expenses were $26,142. Monthly cards to stockholders are now to be discontinued, quarterly statements being substituted.

Rosario—It is reported that English people are to begin operations at this old mine in the Guadalupe y Calvo section in the extreme western part of the State.

HIDALGO

Santa Gertrudis—The final payment was made on this mine, Jan. 24, when Charles S. Thomas, representative of the Camp Bird, Ltd., deposited a check for 9,144,825 pesos. This amount, with the 200,000 pesos already paid, covers the purchase price of the mine and the cyanide plant at Guadalupe. It is the largest single check ever drawn in the Republic of Mexico.

JALISCO

Centralia—This Chicago concern is erecting a small concentrating plant for experimental purposes at its mines in the Hostotipaquillo district.

Hostotipaquillo Power—The Chapala Hydroëlectric and Irrigation Company will have its distributing station for the district in the town of Hostotipaquillo instead of at the El Favor mine. The town is much nearer the Cinco Minas, of the Marcus Daly estate, where it is planned to use up to 1000 horsepower.

MEXICO

Dos Estrellas—The 1000-ton Butters filter plant is nearing completion and will soon be in operation. This is the largest vacuum-filter plant in Mexico.

Esperanza—The 1909 profits were approximately 1,517,582 pesos. A 50-ton Sweetland filter press is being installed for experimental purposes.

SONORA

Santa Rosalia—The main shaft is being lowered from the 350- to the 550-ft. level, from which point a crosscut will be run to tap the vein about 750 ft. below the surface. A small shipment of ore yielded $730.59 per ton, according to President R. K. Clancey.

Mexican Northern—A 100-ton cyanide plant is being installed at this company's property, in the southeastern part of the Magdalena district. A 15-stamp mill is being operated, but recovery has not gone above 55 per cent.

Carmen—Ore has been found on the lower level.

Ray—A. J. King and associates have purchased this mine, an adjoining property to the Cinco de Mayo, from the First National Bank, of Douglas, Ariz.

Lluvia de Oro—Plans for the erection of a stamp mill have been drawn and it is expected to be running by July 1.

Higinio—This mine has done 800 ft. of exploration work during the last year. The ores carry silver and copper.

Llanos de Oro Consolidated—Louis H. Mooser has been appointed receiver for this company, in the Altar district, and will continue operations.

$ · THE MARKETS · $

CURRENT PRICES OF METAL · MINERALS · COAL AND STOCKS · CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, March 9—The Eastern bituminous-coal trade is gradually getting into better shape. There is less trouble over cars and transportation, though conditions are not yet ideal, by any means. The anthracite trade presents nothing new.

In the Western trade the wage scales and the storing of coal against a possible strike are the chief matters of interest. Everyone is waiting the results of the meeting now being held at Cincinnati. The Illinois mines and operators failed to reach an agreement at Peoria last week, and it is uncertain when another trial will be made. Meantime mines are busy shipping coal for storage and current business is active.

Coal Traffic Notes

Coastwise shipments of coal at Atlantic ports, year ended Dec. 31, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York....	14,418,292	10,549,974	24,968,266	61.2
Philadelphia	2,001,866	4,674,276	6,676,142	16 4
Baltimore....	235,233	3,344,225	3,579,458	8.8
Newp't News	.....	3,495,596	3,495,596	8.6
Norfolk.....	.....	2,047,417	2,047,417	5.0
Total.....	16,655,391	24,111,488	40,766,879	100.0
Total, 1908.	17,486,407	23,021,019	40,507,426	.....

The total increase in 1909 was 259,453 tons, or 0.6 per cent.

Coal delivered at Sewalls Point, Va., by the Virginian Railway in 1909 was 241,644 tons, of which 30,425 tons were exported and 48,122 tons bunkered or delivered for fuel to steamships in foreign trade.

New York

Anthracite

March 9—There is nothing new in the anthracite trade. The first touches of spring weather are cutting down domestic sales a little; otherwise business is steady.

Schedule prices for large sizes are $4.75 for lump and $5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, $3@3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.85@2; barley, $1.40@1.50. The lower prices are generally for washery coal.

Bituminous

The trade shows some improvement. While car shortage and transportation are still vexing questions, there is some improvement in both. This is due largely to better weather. Orders are coming in rather more freely, New York harbor especially showing willingness to buy; but it is still the cheaper grades of coal that are in demand. Prices are about the same as for some weeks past.

The discussion of yearly contracts is becoming quite active as the end of March is drawing near. There is much difference of opinion as to prices, as usual.

The Western situation is attracting attention. The point here is to what extent West Virginia coal will be diverted to Western points in case of a general strike. If one does come, probably there will be less of that coal to spare for the seaboard trade.

In the coastwise vessel trade there are more boats to be had. There is no nominal change in rates, but a weaker tendency.

Birmingham

March 7—The coal production in Alabama is very heavy yet with no indications of curtailment. The railroads are doing a little better in handling the product of the mines.

Announcement is made that Chief State Mine Inspector Edward Flynn has resigned, to accept the position of chief inspector of the mines of the Tennessee company. James Hillhouse, heretofore associate, will succeed Mr. Flynn as chief inspector.

Chicago

March 7—Nearly all kinds of coal are in lessened demand and the trade appears to look forward to the usual spring slackness. Steam coals in general are in large demand, but the supply is large also. Screenings, however, hold up firmly to high prices. Domestic coals are weak. Transportation difficulties are no longer a cause of serious complaint, and the prospect seems to be for increased receipts, diminishing consumption of domestic coals and steady, large consumption of the lower-priced steam kinds.

Illinois and Indiana bring the following car prices: Lump and egg, $2.50@2.65; run-of-mine, $2.25@2.35 and screenings, $2.25@2.50. Eastern coals are all in good demand and fair to large supply, smokeless being somewhat weak. Prices on these coals are: Hocking, $3.15; smokeless, $3.65@3.85 for lump and $3.30@3.40 for run-of-mine; Youghiogheny ¾-in. gas, $3.30. The anthracite demand is for small lots, widely distributed, with nut in greatest requirement.

Indianapolis

March 7—Large shipments of coal from the mines of this State have continued for two weeks. Except for interference during the snowstorm the reports from the operators show heavy movements of coal during February. The railroad companies have stocked up liberally and are now furnishing ample cars and the output is very satisfactory.

The executive committee of the United Mine Workers held a meeting in this city during the week. President Lewis said the wage-scale matter was not considered at this meeting. "We had previously decided upon an advance and we will get it. If we don't, we are prepared to strike. Delegates will attend the Cincinnati conference Tuesday and will continue in session from day to day until an agreement is reached, if possible."

James Epperson, State mine inspector, has looked over the proposed site near Terre Haute for the establishment and equipment of a life-saving station. Mr. Epperson will ask the next legislature for an appropriation of $30,000 for the purpose.

Pittsburg

March 8—The convention of operators and miners assembled in Cincinnati this morning and will likely remain in session several days. The opinion is growing that on one ground or another there will be a suspension of mining. While there is no general movement to lay in stocks, there has already been considerable stocking by electric light and gas concerns, as well as by railroads. Coal for such prompt shipment generally commands 10@15c. premium above regular prices. The car supply is reported better this week than for five weeks. We quote regular prices unchanged, except that slack is 5c. higher; mine-run and nut, $1.15; ¾-in., $1.25; domestic 1¼-in., $1.40; slack, $1@1.05 per ton.

Connellsville Coke—The market has continued very quiet, sales being light, but there is increased inquiry, occasionally for early deliveries, but chiefly for second half. This latter inquiry is perhaps only tentative, furnaces looking for an improvement in pig iron and wishing to have coke negotiations under way in order to close should the pig-iron mar-

ket really establish the trend expected. We quote prices on standard grades nominally at $2@2.25 for furnace and $2.75 @3 for foundry.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended Feb. 26, at 461,774 tons, a decrease of 1300 tons from the preceding week; shipments at 4884 cars to Pittsburg, 8723 cars to points west of Pittsburg and 902 cars to points east of Connellsville, a total of 14,509 cars.

St. Louis

March 7—Summer weather prevails with the consequence that the demand from dealers has slowed down. However, the market has maintained itself surprisingly. There has not been the slightest falling off of price on any size of coal. The demand for lump is not as strong owing to weather conditions, yet this is more than offset by the very strong demand for mine-run which is being made in large quantity. Screenings for local shipment are today higher than at any time since 1906. They readily brought $1.10 per ton f.o.b. mine here today. The demand from industries and railroads is enormous and all of them are stocking coal as fast as they can get hold of it.

An enormous tonnage of coal is now moving as the traffic reports show that about 50,000 tons per day is being shipped into the St. Louis market. The car situation remains unchanged on the Illinois Central and Iron Mountain which roads were already so extremely short. High-grade coal is being readily absorbed by dealers and the prices on it remain unchanged. However, it seems to be coming forward more freely now.

Current quotations are as follows, the first being in each instance at the mines and the second f.o.b. St. Louis:

	F.O.B. Mines.	F.O.B. St. Louis.
Standard		
6-in. lump	$2.00	$2.52
2-in. lump	1.90	2.42
Mine run	1.50	2.02
Nut and pea	1.40	1.92
Screenings	1.10	1.62
Pea and slack	0.90	1.42
Springfield, Mt. Olive & Staunton		
6-in. lump	$2.10	$2.62
2-in. lump	2.00	2.52
Mine-run	1.60	2.12
Screenings	1.10	1.62
Franklin County		
6-in. lump	$2.20	$2.87
3-in. nut	2.00	2.67
1¼-in. screenings	1.25	1.92
Carterville		
6-in. lump	$2.00	$2.67
3-in. nut	1.90	2.57
1¼-in. screenings	1.00	1.67

The anthracite market is, of course, slow, owing to the lateness of the season. Though stocks on hand are all low, an unusually brisk April trade is anticipated.

FOREIGN·COAL·TRADE

Bunker Coal at United States Ports—Coal furnished to steamships in foreign trade at United States ports, year ending Dec. 31, long tons:

	1908.	1909.	Changes.
Coast ports	5,797,567	5,890,848	I. 93,281
Great Lakes	226,162	233,400	I. 7,238
Total	6,023,729	6,124,248	I. 100,519

Adding the exports, previously reported, this makes a total of 18,660,805 tons in 1909 sold for consumption beyond the limits of the United States.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Feb. 26: Best Welsh steam, $3.96; seconds, $3.90; thirds, $3.78; dry coals, $3.84; best Monmouthshire, $3.60: seconds, $3.42; best small steam, $2.10; seconds, $1.92. All prices are per long ton, f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, March 9—The iron and steel trades are beginning to revive a little from the quiet which has prevailed since December, but there is still rather a waiting than an active tendency.

In pig iron there are more inquiries, both in eastern and western territory; but many of these include an insistence on lower prices, which makers are not yet willing to concede. Some furnaces, however, are ready to meet buyers rather than let business go past them, and it looks as if their number would increase.

In finished material the chief new business has been in material for railroad equipment and rails. A number of small orders for structural steel are coming up, which make a fair total. Otherwise the market is quiet. Jobbers report an increase in demand for bars, nails and small material, which might be expected with the coming of spring.

Baltimore

March 8—Imports for the week included 6700 tons manganese ore from India; 21,075 tons iron ore from Cuba.

Birmingham

March 7—Optimism is expressed on all sides by the Southern pig-iron makers and while the market right now is a little quiet, there appears to be a feeling that the inquiries coming in will result in business. The quotations are yet a little weak, caused by the resale iron that is to be had. The furnace companies are holding to $14 per ton, No. 2 foundry, for their product, the resale iron to be had from 50 to 75c. cheaper. There is not much of the iron left. There has not been a very great accumulation of iron in the yards, and there is not much being stacked. The foundry iron make is under the average right now. Basic and charcoal irons continue to enjoy a fairly good demand, charcoal iron bringing over $22 per ton. The steel plant of the Southern Iron and Steel Company at Alabama City, near Gadsden, is making steel. The steel plant of the Tennessee company continues to operate steadily. The rail orders, mentioned before, are sufficient to warrant operation practically through the year.

Chicago

March 7—The iron market continues quiet, with Southern pig iron selling at uncertain prices, though the leading sales agents say it is in general held up to the $13 Birmingham mark, which means $17.35 Chicago. Northern iron is firm at $18, and is selling in small lots to the apparent satisfaction of furnace representatives. For both Northern and Southern, indeed, the demand is small and scattering still, with only a rare order for a good-sized tonnage, but some Southern interests undoubtedly are cutting the price in their eagerness to sell. Inquiries are more numerous and some are for large tonnage, based upon last-half requirements.

Notwithstanding large immediate and prospective consumption of pig iron, however, the melters appear to have the notion that overproduction may be near, with accompanying lower prices. On any other ground it is difficult to explain the holding off from contracts for large future needs. For iron and steel products the market is in general quiet, but with good sales of railroad supplies and with structural material showing a little more activity. Coke is in somewhat larger demand and brings $5.75 for the best Connellsville.

Philadelphia

March 9—The chief feature of this pig-iron market at present is the larger number of inquiries from outside sources, including New England, for foundry irons. The actual purchases during the week have fallen below expectations. Offers have been made within 24 hours which involve concessions from asking prices. Additional lots of Southern iron are coming this way. There is no evidence of a further weakening tendency. Basic pig continues strong and the market is in excellent shape at $18. No. 2 foundry has brought $18.25 for Northern and $17.75 for Southern.

Bars—Bar iron has recovered from any supposed weakness it had early in the month.

Sheets—The larger consumers are asking best prices on long deliveries. The mills are well supplied with orders.

Pipes and Tubes—The greatest activity prevails in all plants using tubes. The local strike has had no effect on such establishments.

Plates—Another batch of car-building orders has been scattered among the plate mills of the State. The reports of shaded prices on plates when large buying interests are concerned are not contradicted.

Structural Material—No reduction has been made, but in certain cases large orders have been taken at slightly lower prices.

Scrap—There is an accumulation of scrap now going on since favorable weather permitted easy shipment. Yards are better supplied and buyers are asking for figures on a wide range of scrap from railroad down to stove plate.

Pittsburg

March 8—Throughout the trade there is talk of there having been an improvement, but thus far the improvement appears to be in that intangible thing called sentiment. Perhaps the change is that there is a partial or complete elimination of the feeling, doubtless held in some quarters, that the market was going to go to pieces. There is no prospect that prices will score any important movement in either direction, while the prospect also is that production will be continued at approximately the gait attained in December. The blast furnaces got ahead of the steel works around the holidays and lately the steel works lost considerable production while the blast furnaces continued full production.

Pig Iron—Finding that there was quite a lot of bessemer pig iron to be had at the former purchasing price of $18, Valley, the United States Steel Corporation held off as to the purchase our last report mentioned it might make, and two independent steel companies stepped in and bought between 15,000 and 20,000 tons at $17.50, Valley, one of these being the Cambria Steel Company, which took 10,000 tons. The market on bessemer is thus quotable at $17.50, Valley, 50c. less than at last report. Several sales of basic pig have been put through, most of the iron being from speculators and at prices less than would be done by furnaces, one lot of 3500 tons being at $15.75, Valley. The market, however, is not quotable at under $16, Valley, as the speculative iron is understood to be pretty well cleaned out and the majority of furnaces are quoting at above $16. The Westinghouse Electric and Manufacturing Company is closing at this writing on the 15,000 tons it inquired for a week ago. It is understood that prices down to about $16, Valley, were quoted on this iron, which has surprised the majority of the trade, since it was thought that for the delivery—second half—the furnaces would want more money than for prompt iron, since second-half iron will be made out of this season's ore, which is 50c. higher. The market is quotable at $17.50 for bessemer, $16 for basic, $16.25 for No. 2 foundry and malleable and $15.25 for forge, all at Valley furnaces, freight to Pittsburg being 90 cents.

Steel—There is little steel pressing on the market, but there is plenty to make deliveries on contracts and there is little demand, so that the market is a trifle easier although there has not been enough business done to test the market absolutely. Some inquiry has appeared for sheet-bars for second quarter. We continue to quote billets at $27@27.50 for bessemer, $27.50@28 for open-hearth, sheet-bars at $28.50@29, with $33 for rods.

Ferromanganese—The market is quiet and not over strong. Nominally prices are unchanged at $43.50 for prompt, $44 for second quarter and $44@44.50 for second half, f.o.b. Baltimore, but it is possible that these prices could be shaded. Freight to Pittsburg is $2.30 per ton.

Sheets—Demand is fairly good, prices being well maintained except that the shading of $1 a ton on corrugated sheets continues. Blue annealed sheets are still stronger for early delivery. Subject to the shading in corrugated material the market is quotable at 2.40c. for black sheets, 3.50c. for galvanized, $1.70 per square for painted corrugated, $3 for galvanized corrugated and 1.90c. for blue annealed, 10 gage.

St. Louis

March 7—The pig-iron market remains quiet, though slight improvement has been noted this month. Producers are not at all worried over the situation though the present market is not quite up to expectations. Furnaces are all well covered for the first half and have a small sprinkling of orders for the third quarter. Some concessions have been heard of on small lots for immediate shipment, though the present price is $14.50 per ton f.o.b. Birmingham and $18.25 St. Louis for No. 2 foundry, both for immediate and future delivery.

Foreign Iron

British Iron Trade—Exports and imports for the year ended Dec. 31 are valued by the Board of Trade returns as follows:

	Exports.	Imports.	Excess.
Iron and steel	£38,267,690	£ 7,971,489	Ex. £30,296,201
Machinery	28,088,956	4,438,292	Ex. 23,650,664
New ships	5,914,684	.....	Ex. 5,914,684
Total	£72,271,330	£12,409,781	Ex. £59,861,549
Total, 1908	78,973,019	12,234,416	Ex. 66,738,603

Decrease in total exports, £6,701,689, or 8.5 per cent.; increase in imports, £175,365, or 1.4 per cent. The total quantities of iron and steel were, in long tons:

	1908.	1909.	Changes
Exports	4,096,521	4,218,063	I. 121,542
Imports	1,119,407	1,193,414	I. 74,007

Exports of scrap iron and steel, 137,393 tons in 1908, and 167,664 in 1909; increase, 30,271 tons.

Imports of iron ore into Great Britain for the year were 5,936,808 long tons in 1908, and 6,225,035 in 1909; increase, 288,227 tons. Of the imports in 1909 a total of 4,635,529 tons came from Spain. Imports of manganese ores were 120,702 tons in 1908, and 103,578 in 1909; decrease, 17,124 tons.

Scotch Iron Production—The statement of the Scotch furnaces for the year is as follows, in long tons:

	1908.	1909.	Changes.
Stocks, Jan. 1	96,043	186,045	I. 90,002
Production	1,230,191	1,361,697	I. 131,506
Total	1,326,234	1,547,742	I. 221,508
Domestic sales	827,627	981,355	I. 153,728
Exports	312,562	290,576	D. 21,986
Total sales	1,140,187	1,271,931	I. 131,742
Stocks, Dec. 31	186,045	275,811	I. 89,766

Of the domestic sales in 1909 foundries took 189,889 and steel works 791,466 tons.

Belgian Iron Production—The make of pig iron in Belgium, year ended Dec. 31, was as follows, in metric tons:

	1908.	1909.	Changes.
Foundry iron	76,190	88,960	I. 12,770
Forge iron	127,630	156,590	I. 28,960
Bessemer and basic	1,002,620	1,386,800	I. 384,180
Total	1,206,440	1,632,350	I. 425,410

The total increase in 1909 was 35.3 per cent., the gain being chiefly in basic pig.

METAL MARKETS

New York, March 9—The metal markets generally have been steady and fairly active, but with few notable changes.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1910	$ 6,163,132	$ 2,131,357	Exp. $ 4,031,775
" 1909	7,865,356	3,420,183	" 4,545,173
Year 1910	6,163,132	2,131,357	" 4,031,775
" 1909	7,865,356	3,420,183	" 4,445,173
Silver:			
Jan. 1910	4,498,304	4,248,354	Exp. 249,950
" 1909	4,542,094	3,664,752	" 877,342
Year 1910	4,498,304	4,248,354	" 249,950
" 1909	4,542,094	3,664,752	" 877,342

Exports from the port of New York, week ended March 5: Exports, $196,655, to Panama and the West Indies; silver, $1,095,161, chiefly to London. Imports: Gold, $196,960; silver, $3466, from the West Indies.

Foreign trade of the United States, month of January, as reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports	$ 156,712,842	$ 144,015,350
Imports	103,576,501	133,658,064
Excess, exports	$ 53,136,341	$ 10,357,286
Add excess of exports, silver		249,950
Add excess of exports, gold		4,031,775
Total export balance		$ 14,639,011

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. Supplies were divided between the Bank of England and the Continent. In New York further exports to South America are expected.

Platinum—The market remains steady. Dealers continue to quote $28.50@29 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Silver—The market has continued quiet and steady between 23⅜ and 23 7/16d. in London. The China banks have been good buyers. The market closes at 23⅜d., and is steady at that figure.

SILVER AND STERLING EXCHANGE

Mar.	3	4	5	7	8	9
New York....	50¾	50¾	50¾	50⅞	50⅞	50¾
London.. ..	23 7/16	23⅜	23⅜	23 7/16	23 7/16	23⅜
Sterling Ex..	4.8720	4.8725	4.8725	4.8730	4.8725	4.8700

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Feb. 24, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£ 812,000	£1,173,900	I. £ 361,900
China.....	230,000	257,000	I. 27,000
Straits.....	61,000	.....	D. 61,000
Total.....	£1,103,000	£1,430,900	I. £ 327,900

India Council bills in London sold at an average of 16.09d. per rupee.

Copper, Tin, Lead and Zinc

Mar.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
3	13½ @13¾	13¼ @13½	60½	32⅞	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
4	13½ @13¾	13¼ @13½	60¼	32¾	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
5	13½ @13¾	13¼ @13½	....	32¾	4.52½ @4.57½	4.40 @4.42½	5.57½ @5.62½
7	13⅝ @13¾	13¾ @13½	59⅞	32½	4.52½ @4.55	4.37½ @4.40	5.57½ @5.62½
8	13⅝ @13¾	13⅜ @13½	60¼	32⅝	4.52½ @4.55	4.37½ @4.40	5 57½ @5.62½
9	13⅝ @13¾	13⅜ @13½	60¼	32⅝	4.52½ @4.55	4.37½ @4.40	5.57½ @5.62½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The inquiry from Europe that we mentioned last Wednesday, stimulated by the slight decrease in the statistics, which had a very good effect upon sentiment, materialized in important business on the following day, and on March 3-5 rather large business was done, both for domestic and foreign deliveries, the sales amounting probably in the neighborhood of 50,000,000 lb., electrolytic copper having been sold freely at 13½c., delivered, 30 days, corresponding to about 13.35c. net cash, New York. Since then the sellers have raised their prices further, but on the advance the market became rather dull, which is not surprising in view of the great activity compressed into a few days. Almost all of the agencies are now offering electrolytic copper at 13⅝c., delivered, 30 days, for any delivery up to the end of May and even into June, while some are shading this price materially for the early deliveries. The business in Lake Copper during the week of March 3-9 has been comparatively insignificant. This metal is freely obtainable at 13¾c. and under, but fancy brands have fetched as high as 13⅞c. on small sales and the price of the Calumet & Hecla is reported to be 14⅛c. The market closes firm at 13⅝@13¾c. for Lake, and 13⅜@13½c. for electrolytic in cakes, wirebars and ingots. Casting copper is quoted nominally at 13⅛@13¼c. as the average for the week.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire has been reduced, and is now 14¾c. base, carload lots at mill.

The London standard market fluctuated within narrow limits throughout the week and closes steady at £60 5s. for spot and £61 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £63 10s.@£64; strong sheets, £73 10s.@£74 10s. per ton.

Stocks of copper in Great Britain and France on March 1—including 5230 tons afloat from Chile and Australia—were 113,460 long tons; an increase, as compared with Feb. 1, of 2640 tons.

Copper exports from New York and Philadelphia for the week were 4571 long tons. Our special correspondent gives the exports from Baltimore at 3946 tons copper.

The Lake companies are beginning to make their reports for 1909. Our quotational average for the year was 13.335c. Osceola sold 24,659,729 lb. at 13.30. Allouez, 3,164,608 lb. at 13.26. Centennial, 2,583,793 lb. at 13.28. Tamarack, 13,118,785 lb. at 13.32c. Quincy, 22,511,984 lb. at 13.48. The Quincy figure includes the silver proceeds of that company. The quotational average for electrolytic was 12.982c. The Utah Copper Company reports 51,749,233 lb. sold at net price of 12.915 cents.

Tin—The market in London has been dull with a sagging tendency. While the favorable February statistics were the reason for a firm market the middle of last week, some liquidation which took place forced prices to their low level of £147 7s. 6d. for spot and £149 5s. for three months at the morning call of Tuesday last. The afternoon market, however, showed a reversal of form. The close is steady at £147 12s. 6d. for spot and £149 10s. for three months.

The domestic market, as far as quotations are concerned, moves in sympathy with London, but actual business is restricted to retail lots which can be bought at the close at 32⅝c. per pound.

Visible stocks of tin—including tin afloat—on March 1 were: London, 11,750; Holland, 2064; United States, excluding Pacific ports, 7474; total, 21,288 long tons. This is a decrease, as compared with Feb. 1, of 1736 tons.

Lead—Due to heavy offerings on the part of Missouri producers, prices have again given away, and the close is weaker at 4.52½@4.55c. New York, and 4.37½@4.40c. St. Louis.

The London market is unchanged, the close being cabled at £13 3s. 9d. for Spanish lead, and £13 6s. 3d. for English lead.

Spelter—A fair business is doing from day to day, and the market appears to have found its level, quotations being steady throughout the week at 5.72½@5.77½c. New York, and 5.57½@5.62½c. St. Louis.

New York quotations for spelter March 3-9, inclusive, were 5.72½@5.77½ cents.

The London market is quoted at £23 2s. 6d. for good ordinaries, and £23 7s. 6d. for specials.

Base price of sheet zinc on March 7 was advanced ¼c. per lb., and is now $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier reports from Breslau, Germany, under date of Feb. 25, that the syndicate allotments for 1910 to Group A, including 18 works, are 264,232 tons; to Group B, 12 works, 175,919 tons. These are slightly above the 1909 allotments. Quotations current are 47.25 marks per 100 kg.—equal to 5.10c. per lb.—f.o.b. works in Silesia. Zinc dust is more active, and current prices are 44.25 marks per 100 kg.—4.78c. per lb.—in large lots, f.o.b. Stettin.

Other Metals

Aluminum—The market continues active, and a good business is reported. Quotations are steady, 22½@23½c. being asked for No. 1 ingots, with an advance expected. Abroad there is still a strong tendency.

Antimony—The market remains quiet and prices are unchanged, Cookson's is selling at 8¼@8½c., and U. S. at 7⅞@8c.; while 7¼@7⅜c. is asked for outside brands.

Quicksilver—The market is steady, with a fair business doing and prices unchanged. New York quotations are $50 per flask of 75 lb. for large lots; jobbers ask 70c. per lb. for small parcels. San Francisco, $49@50 for domestic orders; $2 less for export. London, £9 10s. per flask, with £9 7s. 6d. named from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65 @70c. per lb. in 100-lb. lots at Cleveland, Ohio.

Spanish Metal Exports

Exports of metals and minerals from Spain, year ended Dec. 31; reports by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes
Pig and manuf. iron	33,638	59,904	I. 26,266
Copper	14,374	17,745	I. 3,371
Copper precipitate	20,089	16,842	D. 3,247
Lead	182,865	183,240	I. 375
Zinc	1,386	1,606	I. 220
Quicksilver	1,515	1,503	D. 12
Minerals.			
Iron ore	7,252,928	8,544,634	I. 1,291,706
Manganese ore	25,447	14,737	D. 10,710
Copper ore	1,104,696	1,087,060	D. 17,636
Lead ore	3,170	3,661	I. 491
Zinc ore	129,878	131,188	I. 1,310
Pyrites, iron	1,387,081	1,360,325	D. 26,756
Salt	553,949	545,075	D. 8,874

Imports of phosphates, 157,288 tons in 1908, and 172,177 in 1909; increase, 14,889 tons.

Zinc and Lead Ore Markets

Platteville, Wis., March 5—The base price of 60 per cent. zinc ore advanced from $41 to $44 per ton at the week end. No premium price was paid; high-grade producers are holding for further advance. For 80 per cent. lead ore $54@55 per ton was paid.

SHIPMENTS, WEEK ENDED MAR. 5.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	457,900	.....	.....
Platteville	313,200	.....	256,500
Benton	172,650	.....	.....
Highland	120,400	.....	.....
Cuba City	.....	85,110	.....
Hazel Green	.....	41,600	.....
Total	1,064,150	126,710	256,500
Year to date	12,980,190	1,099,099	2,251,550

In addition to the above there was shipped during the week to the separating plants 2,126,750 lb. zinc concentrates.

Joplin, Mo., March 5—The highest price for zinc sulphide ore was $47.50, on a base price of $45 per ton of 60 per cent. zinc, the base ranging up from $43 offerings early in the week. Zinc silicate ore sold on a base of $20@26 per ton of 40 per cent. zinc. Lead sold as high as $55 per ton, an advance of $2 over the closing offers last week. The average price, all grades zinc, was $39.34. The average price, all grades of lead, was $53.88 per ton.

Nearly every mine in the Webb City portion of the district had a "walk-out" of miners during the week. So far as known the wage scale has been satisfactorily adjusted except at the mines of the American Zinc, Lead and Smelting Company, where several hundred miners are employed.

SHIPMENTS, WEEK ENDED MARCH 5.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,398,550	880,610	$111,747
Joplin	2,177,850	326,320	54,554
Alba-Neck	790,230	14,880	16,980
Galena	671,330	74,860	15,447
Duenweg	582,300	29,170	11,442
Aurora	674,020	.....	10,081
Miami	479,590	144,070	9,092
Sarcoxie	616,280	.....	7,309
Granby	376,830	8,690	6,093
Badger	209,190	.....	4,392
Oronogo	199,440	.....	3,469
Carthage	149,570	.....	3,140
Quapaw	128,550	.....	2,571
Cave Springs	127,800	.....	2,556
Spurgeon	160,200	.....	1,922
Carl Junction	65,860	.....	1,383
Totals	11,807,590	1,478,600	$262,178
10 weeks	100,810,540	16,756,030	$2,593,453

Zinc value, the week, $222,342; 10 weeks, $2,126,140
Lead value, the week, 39,836; 10 weeks, 467,313

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	.....	34.71	.....	50.82	.....
April	38.63	.....	37.01	.....	55.63	.....
May	40.06	.....	37.42	.....	56.59	.....
June	44.15	.....	40.35	.....	57.52	.....
July	43.06	.....	41.11	.....	53.74	.....
August	48.25	.....	44.54	.....	57.60	.....
September	47.70	.....	44.87	.....	56.11	.....
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	$43.98	.....	$41.20	.....	$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, March 9—The general market continues steady, but with no special changes.

Copper Sulphate—The market is steady, with a fair business doing. Prices are unchanged at $4.10 per 100 lb. for carload lots and $4.35 per 100 lb. for smaller parcels.

Arsenic—The market is dull, with no considerable sales. In the absence of business, quotations are nominal at $2.50 @2.62½ per 100 lb. for white arsenic.

Nitrate of Soda—Business is on a large scale, and supplies are abundant. Futures are a little firmer, and 2.10c. per lb. is now asked for all positions.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on March 1 as follows, in long tons:

	1909.	1910.	Changes.
Stocks, Jan. 1	9,140	14,000	I. 4,860
Imports, 2 mos.	47,100	81,800	I. 34,700
Total supplies	56,240	95,800	I. 39,560
Deliveries, 2 mos.	50,310	66,500	I. 16,190
Stocks, Mar. 1	5,930	29,300	I. 23,370
Afloat for U. S. ports	82,500	100,000	I. 17,500

Quantities afloat include all cargoes due to arrive at United States ports before June 15 next.

MINING·STOCKS $

New York, March 9—Depression in the early part of the week in the general market was replaced later by a stronger feeling and an advancing tendency. This was especially notable in the Steel Corporation shares and in Reading. There was no special news affecting the market, but a better sentiment. It is still a traders' market largely.

On the Curb the general course of business was the same, a stronger feeling replacing the weak and irregular feeling. Most of the coppers advanced, closing strong. Cobalt stocks looked up a little, and the same was the case with the Nevada shares. The proposed combination of a number of the Comstock companies aroused some interest.

Boston, March 8—Copper stocks continue to show improvement, although activity is confined to specialties. The Cole-Ryan stocks are getting back into their old position. Calumet & Arizona is $6 higher at $79, while strength is shown in Greene-Cananea and Giroux.

A sharp $3.25 drop in the price of Mass mining shares today to $4.50, was accompanied by reports that an assessment would be levied in the near future. There is still talk of consolidation of this property with the Adventure.

That there has been a steady absorption of North Butte mining stock is evidenced by the fact that the price is up $14 from the low of the early year. There has been buying of Franklin, and the price has risen over $3 to $22.37½.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev	Mar. 12	Apr. 7	$0.05
Bader, Cal	Feb. 24	Mar. 14	0.10
Belcher, Nev	Mar. 9	Mar. 29	0.10
Central Eureka, Nev	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Confidence, Nev	Mar. 25	Apr. 15	0 20
Crown Point, Nev	Mar. 8	Mar. 28	0.10
Gould & Curry, Nev	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev	Mar. 9	Mar. 31	0.10
Julia Con., Nev	Feb. 17	Mar. 10	0.03
King Philip Copper, Mich	Mar. 10	.....	1.00
Mexican, Nev	Feb. 21	Mar. 17	0.15
New Arcadian, Mich	Mar. 10	.....	1.00
Ojibway, Mich	Mr.Oct.	.....	2.00
Oneco, Mich	Feb. 15	.....	1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Rexall S. & C., Utah	Feb. 13	Mar. 15	0.01
Seg. Belcher, Nev	Mar. 8	Mar. 28	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Union, Nev	Mar. 7	Mar. 31	0.10
Wabash, Utah	Feb. 21	Mar. 15	0.05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Amalgamated has had a good week of it with a $5.50 advance to $83.25 per share.

Curb trading has been influenced by the course of prices in the big market. Bohemia and South Lake are both higher.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
II, 1909	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672

VISIBLE STOCKS.

	United States.	Europe.	Total.
III, 1909	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III		254,150,400	

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	.....	23.227	.....
April	51.428	.....	23.708	.....
May	52.905	.....	24.343	.....
June	52.138	.....	24.166	.....
July	51.043	.....	23.519	.....
August	51.125	.....	23.588	.....
September	51.440	.....	23.743	.....
October	50.923	.....	23.502	.....
November	50.703	.....	23.351	.....
December	52.226	.....	24.030	.....
Total	51.502	.....	23.726	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	.....	12.826	.....	56.231	.....
April	12.56⅛	.....	12.93¾	.....	57.363	.....
May	12.893	.....	13.238	.....	59.338	.....
June	13.214	.....	13.548	.....	59.627	.....
July	12.880	.....	13.363	.....	58.556	.....
August	13.007	.....	13.296	.....	59.393	.....
September	12.870	.....	13.210	.....	59.021	.....
October	12.700	.....	13.030	.....	57.551	.....
November	13.125	.....	13.354	.....	58.917	.....
December	13.298	.....	13.647	.....	59.906	.....
Year	12.982	.....	13.335	.....	58.732	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	.....
February	28.978	32.920	August	29.942	.....
March	30.577	.....	September	28.815	.....
April	31.702	.....	October	29.444	.....
May	30.015	.....	November	30.348	.....
June	28.024	.....	December	29.154	.....
			Av. Year	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	.....	3.835	.....	13.438	.....
April	4.168	.....	4.051	.....	13.297	.....
May	4.287	.....	4.214	.....	13.225	.....
June	4.350	.....	4.291	.....	13.031	.....
July	4.321	.....	4.188	.....	12.563	.....
August	4.363	.....	4.227	.....	12.475	.....
September	4.342	.....	4.215	.....	12.781	.....
October	4.341	.....	4.215	.....	13.175	.....
November	4.370	.....	4.252	.....	13.047	.....
December	4.560	.....	4.459	.....	13.125	.....
Year	4.273	.....	4.153	.....	13.049	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	.....	4.607	.....	21.438	.....
April	4.965	.....	4.815	.....	21.531	.....
May	5.124	.....	4.974	.....	21.975	.....
June	5.402	.....	5.252	.....	22.000	.....
July	5.402	.....	5.252	.....	21.969	.....
August	5.729	.....	5.579	.....	22.125	.....
September	5.796	.....	5.646	.....	22.906	.....
October	6.199	.....	6.043	.....	23.200	.....
November	6.381	.....	6.231	.....	23.188	.....
December	6.249	.....	6.099	.....	23.094	.....
Year	5.503	.....	5.352	.....	22.201	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	.....	15.84	.....	15.62	.....
April	15.79	.....	15.05	.....	15.06	.....
May	15.77	.....	15.02	.....	15.08	.....
June	16.13	.....	15.84	.....	15.63	.....
July	16.40	.....	15.90	.....	15.96	.....
August	17.16	.....	16.17	.....	16.20	.....
September	18.44	.....	16.80	.....	17.03	.....
October	19.75	.....	17.84	.....	18.02	.....
November	19.90	.....	18.37	.....	18.09	.....
December	19.90	.....	18.15	.....	17.90	.....
Year	$17.46	.....	$16.46	.....	$16.40	.....

STOCK QUOTATIONS

COLO. SPRINGS Mar. 8

Name of Comp.	Bid.
Listed:	
Acacia	.05⅞
Cripple Cr'k Con.	.02⅛
C. K. & N.	.10
Doctor Jack Pot	.07⅛
Elkton Con	.68½
El Paso	.67
Fannie Rawlins	.06
Findlay	.09⅞
Gold Dollar	.09
Gold Sovereign	.03⅛
Isabella	.16
Mary McKinney	.46½
Pharmacist	.03
Portland	1.04½
Vindicator	.78½
Work	.06
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.08½

SALT LAKE Mar. 8

Name of Comp.	Clg.
Carisa	.65
Colorado Mining	.85
Columbus Con	.58
Daly Judge	4.00
Grand Central	1.60
Iron Blossom	.90
Little Bell	1.65
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.87½
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.50
New York	.13
Prince Con	.74
Red Warrior	‡6.00
Silver King Coal'n	2.97½
Sioux Con	.45
Uncle Sam	.41
Victoria	1.05

SAN FRANCISCO. Mar. 8.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		MISC. NEVADA	
Atlanta	.15	Belmont	1.97
Belcher	1.32	Daisy	.06
Best & Belcher	.75	Jim Butler	.12
Caledonia	.88	MacNamara	.26
Challenge Con	.45	Midway	.26
Chollar	.38	North Star	.02
Confidence	1.30	West End Con	.45
Con. Cal. & Va	1.77	Atlanta	.15
Crown Point	1.30	Booth	.18
Exchequer	.33	C.O.D. Con	.11
Gould & Curry	.38	Columbia Mt.	.05
Hale & Norcross	.65	Comb. Frac.	.33
Mexican	1.90	Great Bend	.03
Ophir	2.05	Jumbo Extension	.36
Overman	1.50	Oro	.08
Potosi	.71	Red Hill	.04
Savage	.58	Sandstorm	.04
Sierra Nevada	.74	Silver Pick	.10
Union	.97	St. Ives	.19
Yellow Jacket	1.27	Tramps Con	.05

N. Y. EXCH. Mar. 8

Name of Comp.	Clg.
Amalgamated	83⅛
Am. Agri. Chem.	48
Am.Sm.&Ref.,com	88⅞
Am. Sm. & Ref., pf.	110⅛
Anaconda	51⅞
Bethlehem Steel	30¾
Col. & Hock. C. & I.	18
Colo. Fuel & Iron	43
Du Pont P'd'r, pf.	85
Federal M. & S.	80
Great Nor., ore ctf.	71½
Nat'nalLead,com.	85¼
National Lead, pf.	109½
Pittsburg Coal	23
RepublicI&S,com.	41¼
Republic I & S, pf.	104
SlossSheffi'd,com.	82
Sloss Sheffield, pf.	‡117½
Tennessee Copper	35¾
Utah Copper	52½
U. S. Steel, com.	89
U. S. Steel, pf.	122⅜
Va. Car. Chem	57

N. Y. CURB Mar. 8

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	20¼
Braden Copper	4⅝
B. C. Copper	7
Buffalo Mines	3½
Butte Coalition	27⅜
Chino Copper	14⅞
Cobalt Central	.18½
Combination Fra.	.33
Con. Ariz. Sm.	2⅞
Cumberland Ely.	9
Davis-Daly	3⅜
Dominion Cop.	7
Ely Con	13/16
El Rayo	2 9/16
Florence	3⅛
Gila Copper	8⅝
Giroux	10⅛
Gold Hill	1½
Goldfield Con	8½
Greene Cananea	10⅝
Guanajuato	1¾
Guggen. Exp.	225
Kerr Lake	.08¾
La Rose	4 9/16
McKinley-Dar-Sa.	.82
Miami Copper	24⅞
Mines Co. of Am.	50
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1 5/16
Newhouse M. & S.	3½
Nipissing Mines	10¼
Ohio Copper	4⅜
Pacific Sm. & M.	⅞
Silver Queen	.21
Standard Oil	645
Stewart	9/16
Tonopah	7⅜
Tonopah Ex.	.73
Tri-Bullion	⅞
Utah Apex	‡5⅛
W. Va. Wyo. Cop.	2⅛
Yukon Gold	4⅛

LONDON Mar. 9

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 7 3
Esperanza	2 18 6
Tomboy	0 17 6
El Oro	1 8 9
Oroville	0 10 0

BOSTON EXCH. Mar. 8

Name of Comp.	Clg.
Adventure	9¼
Allouez	56½
Am. Zinc	30
Arcadian	8
Arizona Com	39½
Atlantic	9¼
Boston Con	20
Calumet & Ariz.	79
Calumet & Hecla	630
Centennial	23
Con. Mercur	.10
Copper Range	78½
Daly-West	9¼
East Butte	10½
Franklin	22¼
Greene—Can.	10⅜
Hancock	27
Isle Royal	22
Keweenaw	4¾
La Salle	17½
Mass	5⅞
Michigan	7½
Mohawk	65
Nevada	24½
North Butte	44
Ojibway	12
Old Dominion	45¾
Osceola	154
Parrot	20
Quincy	89
Shannon	15⅝
Superior	59
Superior & Bost.	13⅞
Superior & Pitts.	14¼
Tamarack	71
Trinity	8⅝
U. S. Smg. & Ref.	48¼
U.S.Sm. & Re., pd.	51½
Utah Con	3¼
Victoria	4⅞
Winona	10½
Wolverine	145½
Wyandotte	2⅜

BOSTON CURB Mar. 8

Name of Comp.	Clg.
Ahmeek	210
Bingham Mines	5
Boston Ely	3 1/16
Calaveras	5⅞
Champion	.09
Chemung	12½
Chief Cons	27
Chino	14½
Corbin	.09¾
Cactus	5½
Crown Reserve	3⅝
First Nat. Cop.	4⅝
Gila Copper	8½
Indiana	‡34½
Inspiration	83¾
Majestic	.94
Ray Central	3¾
Ray Con	‡21½
Rawhide Coal.	.21
Rhode Island Coal	9½
San Antonio	8½
South Lake	13¼
Trethewey	1⅞
Vulture	9⅝
Yuma	1⅞

ST. LOUIS Feb. 26

N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.06
Center Cr'k	1.75	1.50
Cent.C.&C.	82.00	81.00
C.C. & C. pf.	84.00	83.00
Cent. Oil	110.00	100.00
Con. Coal	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet	.32	.28
St. Joe	14.00	12.50

‡Last quotation.